



PROJECT ID:

S216-399A

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS

30-30 THOMSON AVENUE  
LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000  
WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

ORIGINAL  
JUL 10 2012

VOLUME 1 OF 3

**LAW**

# BID BOOKLET

FOR FURNISHING ALL LABOR AND MATERIALS  
NECESSARY AND REQUIRED FOR:

## Southwest Brooklyn Marine Transfer Station - Building Construction

LOCATION:  
BOROUGH:  
CITY OF NEW YORK

1824 Shore Parkway  
Brooklyn 11214

CONTRACT NO. 1

GENERAL CONSTRUCTION WORK

New York City Department of Sanitation

Greeley & Hansen LLC



Date:

July 10, 2012

02-112  
02-





NEW YORK CITY DEPARTMENT OF  
DESIGN + CONSTRUCTION

**Ramon Rodriguez**

Agency Chief  
Contracting Officer

February 19, 2014

CERTIFIED MAIL - RETURN RECEIPT REQUEST

PRISMATIC DEVELOPMENT CORP.

60 Rt. 46

Fairfield, NJ 07004

RE: FMS ID: S216-399A  
E-PIN: 85013B0001001  
DDC PIN: 8502013TR0001C  
SOUTHWEST BROOKLYN MARINE  
TRANSFER STATION-BUILDING  
CONSTRUCTION  
**NOTICE OF AWARD**

Dear Contractor:

You are hereby awarded the above referenced contract based upon your bid in the amount of \$139,800,000.00 submitted at the bid opening on November 20, 2012. Within ten (10) days of your receipt of this notice of award, you are required to take the actions set forth in Paragraphs (1) through (3) below. For your convenience, attached please find a copy of Schedule A of the General Conditions to the Contract, which sets forth the types and amounts of insurance coverage required for this contract.

- (1) Execute four copies of the Agreement in the Contracts Unit, 30-30 Thomson Avenue, 1<sup>st</sup> Floor, Long Island City, New York (IDCNY Building). A Commissioner of Deeds will be available to witness and notarize your signature. The Agreement must be signed by an officer of the corporation or a partner of the firm.
- (2) Submit to the Contracts Unit four properly executed performance and payment bonds. If required for this contract, copies of performance and payment bonds are attached.
- (3) Submit to the Contracts Unit the following insurance documentation: (a) original certificate of insurance for general liability in the amount required by Schedule A, and (b) original certificates of insurance or other proof of coverage for workers' compensation and disability benefits, as required by New York State Law. The insurance documentation specified in this paragraph is required for registration of the contract with the Comptroller's Office.



On or before the contract commencement date, you are required to submit all other certificates of insurance and/or policies in the types and amounts required by Schedule A. Such certificates of Insurance and/or policies must be submitted to the Agency Chief Contracting Office, Attention: Risk Manager, Fourth Floor at the above indicated department address.

Your attention is directed to the section of the Information for Bidders entitled "Failure to Execute Contract". As indicated in this section, in the event you fail to execute the contract and furnish the required bonds within the (10) days of your receipt of this notice of award, your bid security will be retained by the City and you will be liable for the difference between your bid price and the price for which the contract is subsequently awarded, less the amount of the bid security retained.

Sincerely,

Lorraine Holley  
DACCO

## Bid Tab

### Revised\* Description

### SOUTHWEST BROOKLYN MARINE TRANSFER STATION-BUILDING CONSTRUCTION

Bid Date	11/20/2012	FMS ID	S216-399A
Estimated Cost	\$151,229,230*	PLA	Yes
Bid Security	2% of Total Bid Price	Client Agency	DOS
Time Allowed	1095 CCD	Contract Manager	Eugene Werner*
Addendum	4	Project Manager	Ziedonis, John
PIN	8502013TR0001C	E-PIN	85013B0001
Selective Bidding	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Consultant	Greeley & Hansen LLC

Bid Rank	Vendor	Bid Amount	Security Type
1	Worth Construction Co.	\$131,166,950.00	Bond
2	PRISMATIC DEVELOPMENT CORP.	\$139,800,000.00	Bond
3	CCA CIVIL- HALMAR INTERNATIONAL, LLC	\$144,117,961.00	Bond
4	E W HOWELL	\$146,870,000.00	Bond
5	BROOKLYN TRANSFER JV	\$155,146,078.00	Bond
6	SKANSKA USA CIVIL NORTHEAST INC.	\$161,080,000.00	Bond
7	T. A. AHERN CONTRACTORS CORP.	\$177,815,000.00	Bond

#### Subcontractor:

Plumbing – 4J's Plumbing. - \$2,193,000.00\*

HVAC – C.D.E. Air Conditioning Company, Inc. - \$8,000,000.00\*

Electrical – Tru-Val Electric. - \$15,900,000.00\*

Recorder: Tia Clarke – ext. 2608

Approver: 

Bid Tab

Pin: 8502013TR0001C

Page 1 of 1

## Qualification Form

Project ID: S216-399A

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: Prismatic - Hunter Roberts Joint Venture

Name of Project: Yankee Stadium Parking Garages

Location of Project: Yankee Stadium

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: Emil J. Martone, NYEDC

Title: Project Manager

Phone Number: 212-312-3805

Brief description of work completed: Three precast parking garages,  
3182 Parking Spaces, Ramps, Driveways.

Was the work performed as a prime or a subcontractor:

JV Partnership 50/50

Amount of Contract: \$300,000,000.00

Date of Completion: March, 2009

\*\*\*\*\*  
Name of Contractor: Prismatic Development Corporation

Name of Project: North Shore Marine Transfer Station

Location of Project: Queens, NY

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: Brij Shrivastava

Title: Project Manager

Phone Number: 212-437-4520

Brief description of work completed: Structures & Equipment

Was the work performed as a prime or a subcontractor:

Prime

Amount of Contract: \$162,000,000.00

Date of Completion: 80% complete

## Qualification Form

Project ID: S216-399A

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: Prismatic Development Corporation

Name of Project: Hamilton Avenue Marine Transfer Station

Location of Project: Brooklyn, NY

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: Brij Shrivastava

Title: Project Manager Phone Number: 212-437-4520

Brief description of work completed: Structures & Equipment

Was the work performed as a prime or a subcontractor: JV - Prismatic - J.H. Reid - Prismatic Lead

Amount of Contract: \$142,000,000.

Date of Completion: 65% to complete

\*\*\*\*\*

Name of Contractor: \_\_\_\_\_

Name of Project: \_\_\_\_\_

Location of Project: \_\_\_\_\_

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: \_\_\_\_\_

Title: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Brief description of work completed: \_\_\_\_\_

Was the work performed as a prime or a subcontractor: \_\_\_\_\_

Amount of Contract: \_\_\_\_\_

Date of Completion: \_\_\_\_\_

#2

Tax ID #: 22-2433095

PIN#: 8502013TR0001C



Contract # 1 - General Construction Work

The City of New York

**SCHEDULE B - Subcontractor Utilization Plan -Part I: Agency's Target**

This page to be completed by contracting agency

**Contract Overview**

Pin # 8502013TR0001C FMS Project ID#: S216-399A

Project Title Southwest Brooklyn Marine Transfer Station - Building Construction

Contracting Agency Department of Design and Construction

Agency Address 30-30 Thomson Avenue City Long Island City State NY Zip Code 11101

Contact Person James A. Cerasoli Title Deputy Director

Telephone # (718) 391-1549 Email cerasoli@ddc.nyc.gov

**Project Description**

This Project consists of the construction of a new marine transfer station. The principal items of work include construction of a new marine transfer station with access ramps, demolition of existing fendering systems, site work, utilities, equipment, dredging, HVAC systems, plumbing systems, fire protection, and electrical systems.

**(1) ☒ Target Subcontracting Percentage**

Percentage of total contract dollar value that agency estimates will be awarded to subcontractors in amounts under \$1 million for construction and professional services.

10 %**Subcontractor Participation Goals**

Summarize the anticipated goals for construction and professional services, by ethnicity and gender.

Group	Construction	Professional Services
Black American	UNSPECIFIED %	N/A %
Hispanic American	UNSPECIFIED %	N/A %
Asian American	UNSPECIFIED %	No Goal
Caucasian Female	No Goal	N/A %
<b>Total Participation Goals</b>	<b>(2) 50 %</b>	<b>(3) N/A %</b>

\* Note: For this procurement, individual ethnicity and gender goals are not specified. The Total Participation Goals for construction subcontracts may be met by using Black American, Hispanic American or Asian American firms or any combination of such firms.

Tax ID #: 22-2433095

PIN#: 8502013TR0001C

**SCHEDULE B - Subcontractor Utilization Plan - Part II: Bidder/Proposer Subcontracting Plan**

This page and the next (Part II herein) are to be completed by the bidder/proposer. **AFFIRMATIONS: Bidder/proposer must check applicable boxes below, affirming compliance with M/WBE requirements.**

Bidder/proposer ☒ **AFFIRMS** or ☐ **DOES NOT AFFIRM** [statement below]

It is a material term of the contract to be awarded that, with respect to the total amount of the contract to be awarded, bidder/proposer will award one or more subcontracts for amounts under one million dollars, sufficient to meet or exceed the Target Subcontracting Percentage (as set forth in Part I) unless it obtains a full or partial waiver thereof, and it will award subcontracts sufficient to meet or exceed the Total Participation Goals (as set forth in Part I) unless such goals are modified by the Agency.

Bidder/proposer ☒ **AFFIRMS** that it intends to meet or exceed the Target Subcontracting Percentage (as set forth in Part I); or

☐ **AFFIRMS** that it has obtained a full/partial pre-award waiver of the Target Subcontracting Percentage (as set forth in Part I) and intends to award the modified Target Subcontracting Percentage, if any; or

☐ **DOES NOT AFFIRM**

**Section I: Prime Contractor Contact Information**

Tax ID # 22-2433095

FMS Vendor ID #

Business Name Prismatic Development Corporation

Contact Person David A. Temeles

Address 60 US Highway 46, Fairfield, NJ 07004

Telephone # 973-882-1133

Email dat@prisdev.com

**Section II: General Contract Information****1. Define the industry in which work is to be performed.**

- **Construction** includes all contracts for the construction, rehabilitation, and/or renovation of physical structures. This category does include CM Build as well as other construction related services such as: demolition, asbestos and lead abatement, and painting services, carpentry services, carpet installation and removal, where related to new construction and not maintenance.
- **Professional Services** are a class of services that typically require the provider to have some specialized field or advanced degree. Services of this type include: legal, management consulting, information technology, accounting, auditing, actuarial, advertising, health services, pure construction management, environmental analysis, scientific testing, architecture and engineering, and traffic studies, and similar services.

**a. Type of work on Prime Contract (Check one):****b. Type of work on Subcontract (Check all that apply):**

☒ **Construction** ☐ **Professional Services** ☒ **Construction** ☐ **Professional Services** ☐ **Other**

**2. What is the expected percentage of the total contract dollar value that you expect to award to all subcontracts?**

80 %

**3. Will you award subcontract(s) in amounts below \$ 1 million for construction and/or professional services contracts within the first 12 months of the notice to proceed on the contract?**

☒ **Yes** ☐ **No**

**Section III: Subcontractor Utilization Summary**

**IMPORTANT: If you do not anticipate that you will subcontract at the target level the agency has specified, because you will perform more of the work yourself, you must seek a waiver of the Target Subcontracting Percentage by completing p. 9).**

Step 1:	Subcontracts under \$1M (4) (construction/professional services)	Total Bid/Proposal Value	Calculated Target Subcontracting Percentage
Calculate the percentage (of your total bid) that will go towards subcontracts under \$1M for construction and/or professional services	14,000,000	\$ 139,800,000	10 %

- **Subcontracts under \$1M (construction/professional services):** Enter the value you expect to award to subcontractors in dollars for amounts under \$1 million for construction and/or professional services. This value defines the amount that participation goals apply to, and will be entered into the first line of Step 2.
- **Total Bid/Proposal Value:** Provide the dollar amount of the bid/proposal.
- **Calculated Target Subcontracting Percentage:** The percentage of the total contract dollar value that will be awarded to one or more subcontractors for amounts under \$1 million for construction and/or professional services. This percentage must equal or exceed the percentage listed by the agency on page 1, at line (1).

**NOTE: The "Calculated Target Subcontracting Percentage" MUST equal or exceed the Target Subcontracting Percentage listed by the agency on Page 6, Line (1).**

Tax ID #: 22-2433095

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## SCHEDULE B - cont.

Step 2:

Calculate value of subcontractor participation goals

Subcontracts under \$1M  
(construction/professional services)

1. Copy value from Step 1, line (4) – the total value of all expected subcontracts under \$1M for construction and/or professional services

\$ 14,000,000

2. \* From line a. above, allocate the dollar value of "Subcontracts under \$1M" by Construction and Professional Services,

Construction

Professional Services

- \* If all subcontracts under \$1M are in one industry, enter '0' for the industry with no subcontracts.

- \* Amounts listed on these lines should add up to the value from line a.

Subcontracts under \$1M by Industry \$ 14,000,000

\$ N/A

- \* For Construction enter percentage from line (2) from Page 6.

- \* For Professional Services enter percentage from line (3) from Page 6.

- \* Total Participation Goals Percentages must be copied from Part I, lines (2) and (3).

Total Participation Goals x 50 %

x %

3. Value of Total Participation Goals

\$ 7,000,000

3:

☒ Subcontracts in Amounts Under \$1 M Scope of Work – Construction

Waterproofing, Dampproofing, Fencing, Paving, reproofing, Sealants, Tile, Glass & Glazing, Overhead Doors, Louvers & Other MEP, Site and Architectural Trades.

☒ Subcontracts in Amounts Under \$1 M Scope of Work – Professional Services

N/A

## Section IV: Vendor Certification and Required Affirmations

I hereby 1) acknowledge my understanding of the M/WBE requirements as set forth herein and the pertinent provisions of Local Law 129 of 2005, and the rules promulgated thereunder; 2) affirm that the information supplied in support of this subcontractor utilization plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE requirements of this Contract and the pertinent provisions of Local Law 129 of 2005, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this contract; 4) agree and affirm that it is a material term of this contract that the Vendor will award subcontract(s) sufficient to meet the Target Subcontracting Percentage, unless a waiver is obtained, and the Vendor will award subcontract(s) sufficient to meet the Total Participation Goals unless such goals are modified by the Agency; and 5) agree and affirm, if awarded this contract the Vendor intends to make all reasonable, good faith efforts to meet the Target Subcontracting Percentage, or if the Vendor has obtained a waiver, the Vendor intends to meet the modified Target Subcontracting Percentage, if any, and the Vendor intends to solicit and obtain the participation of M/WBEs so as to meet the Total Participation Goals unless modified by the Agency.

Signature: Robert V. Gamba  
Print Name: Robert V. Gamba  
Prismatic Development Corporation

Date: November 20, 2012  
Title: President / C.E.O.



Tax ID #: 22-2433095

PIN#: 8502013TR0001C

**SCHEDULE B****PART III - REQUEST FOR WAIVER OF TARGET SUBCONTRACTING PERCENTAGE****Contract Overview**

Tax ID # \_\_\_\_\_ FMS Vendor ID # \_\_\_\_\_  
 Business Name \_\_\_\_\_  
 Contact Name \_\_\_\_\_ Telephone # \_\_\_\_\_ Email \_\_\_\_\_  
 Type of Procurement ☐ Competitive Sealed Bids ☐ Other Bid/Response Due Date \_\_\_\_\_

PIN# (for this procurement) \_\_\_\_\_ Type of work on Prime Contract \_\_\_\_\_ Type of work on Subcontract (check all that apply)  
 (Check one):  
☐ Construction ☐ Construction ☐ Other  
☐ Professional Services ☐ Professional Services

**SUBCONTRACTING** as described in bid/solicitation documents (Copy this % figure from Subcontract for this Contract Plan, Part I, Box \_\_\_\_\_)  
 \_\_\_\_\_ % of the total contract value anticipated by the agency to be subcontracted for construction/professional services subcontracts valued below \$1 million (each)

**ACTUAL SUBCONTRACTING** as anticipated by vendor seeking waiver  
 \_\_\_\_\_ % of the total contract value anticipated in good faith by the bidder/proposer to be subcontracted for construction/professional services subcontracts valued below \$1 million (each)

**Basis for Waiver Request:** Check appropriate box & explain in detail below (attach additional pages if needed)

- ☐ Vendor does not subcontract construction/professional services, and has the capacity and good faith intention to perform all such work itself.
- ☐ Vendor subcontracts some of this type of work but at lower % than bid/solicitation describes, and has the capacity and good faith intention to do so on this contract.
- ☐ Other \_\_\_\_\_

**References**

List 3 most recent contracts/subcontracts performed for NYC agencies (if any)

CONTRACT NO.	AGENCY	DATE COMPLETED
_____	_____	_____
CONTRACT NO.	AGENCY	DATE COMPLETED
_____	_____	_____
CONTRACT NO.	AGENCY	DATE COMPLETED
_____	_____	_____

List 3 most recent contracts/subcontracts performed for other agencies/entities (complete ONLY if vendor has performed fewer than 3 NYC contracts)

TYPE OF WORK	AGENCY/ENTITY	DATE COMPLETED
Manager at agency/entity that hired vendor (Name/Phone No.)	_____	_____
TYPE OF WORK	AGENCY/ENTITY	DATE COMPLETED
Manager at agency/entity that hired vendor (Name/Phone No.)	_____	_____
TYPE OF WORK	AGENCY/ENTITY	DATE COMPLETED
Manager at agency/entity that hired vendor (Name/Phone No.)	_____	_____

**VENDOR CERTIFICATION:** I hereby affirm that the information supplied in support of this waiver request is true and correct and that this request is made in good faith

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Print Name: \_\_\_\_\_ Title: \_\_\_\_\_

**Shaded area below is for agency completion only**

**AGENCY CHIEF CONTACTING OFFICER APPROVAL**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**CITY CHIEF PROCUREMENT OFFICER APPROVAL**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# 2

**BID FORM**  
**THE CITY OF NEW YORK**  
**DEPARTMENT OF DESIGN AND CONSTRUCTION**  
**DIVISION OF STRUCTURES**

**BID FOR FURNISHING ALL LABOR AND**  
**MATERIAL NECESSARY AND REQUIRED FOR:**

**PROJECT ID: S216-399A**

**Southwest Brooklyn Marine Transfer Station - Building Construction**  
**1824 Shore Parkway**  
**Brooklyn 11214**

Name of Bidder: Prismatic Development Corporation

Date of Bid Opening: \_\_\_\_\_

Bidder is: (Check one, whichever applies) Individual ( ) Partnership ( ) Corporation (X)

Place of Business of Bidder: 60 US Highway 46, Fairfield, NJ 07004

Bidder's Telephone Number: 973-882-1133 Bidder's Fax Number: 973-882-1132

Bidder's Email Address: dat@prisdev.com / rvg@prisdev.com

Residence of Bidder (If Individual): \_\_\_\_\_

If Bidder is a Partnership, fill in the following blanks:

Names of Partners

Residence of Partners

_____	_____
_____	_____
_____	_____

If Bidder is a Corporation, fill in the following blanks:

Organized under the laws of the State of NJ

Name and Home Address of President: Robert V. Gamba  
60 Beachmont Terrace, North Caldwell, NJ 07006

Name and Home Address of Secretary: David A. Temeles  
29 Sherwood Drive, Morris Twp., NJ 07960

Name and Home Address of Treasurer: David A. Temeles  
29 Sherwood Drive, Morris Twp., NJ 07960

## BID FORM

Prismatic Development Corporation

The above-named Bidder affirms and declares:

1. The said bidder is of lawful age and the only one interested in this bid; and no person, firm or corporation other than hereinbefore named has any interest in this bid, or in the Contract proposed to be taken.
2. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
3. No councilman or other officer or employee or person whose salary is payable in whole or in part from the City Treasury is directly or indirectly interested in this bid, or in the supplies, materials, equipment, work or labor to which it relates, or in any of the profits thereof.
4. The bidder is not in arrears to the City of New York upon debt or contract or taxes, and is not a defaulter, as surety or otherwise, upon any obligation of the City of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York or State of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except as set forth on the Affirmation included as page 17 of this Bid Booklet.

The bidder hereby affirms that it has paid all applicable City income, excise and other taxes for all years it has conducted business activities in New York City.

5. The bidder, as an individual, or as a member, partner, director or officer of the bidder, if the same be a firm, partnership or corporation, executes this document expressly warranting and representing that should this bid be accepted by the City and the Contract awarded to him, he and his subcontractors engaged in the performance:
  - (1) will comply with the provisions of Section 6-108 of the Administrative Code of the City of New York and the non-discrimination provisions of Section 220a of the New York State Labor Law, as more expressly and in detail set forth in the Agreement; (2) will comply with Section 6-109 of the Administrative Code of the City of New York in relation to minimum wages and other stipulations as more expressly and in detail set forth in the Agreement; (3) have complied with the provisions of the aforesaid laws since their respective effective dates, and (4) will post notices to be furnished by the City, setting forth the requirements of the aforesaid laws in prominent and conspicuous places in each and every plant, factory, building and structure where employees engaged in the performance of the Contract can readily view it, and will continue to keep such notices posted until the supplies, materials and equipment, or work labor and services required to be furnished or rendered by the Contractor have been finally accepted by the City. In the event of any breach or violation of the foregoing, the Contractor may be subject to damages, liquidated or otherwise, cancellation of the Contract and suspension as a bidder for a period of three years. (The words, "the bidder", "he", "his", and "him" where used shall mean the individual bidder, firm, partnership or corporation executing this bid).

6. Compliance Report

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, (1) represents that his attention has been specifically drawn to Executive Order No. 50, dated April 25, 1980, on Equal Employment Compliance of the contract, and (2) warrants that he will comply with the provisions of Executive Order No. 50. The Employment Report must be submitted as part of the bid.

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, executes this document expressly warranting that he will comply with: (1) the provision of the contract on providing records, Chapter 8.

7. By submission of this bid, the bidder certifies that it now has and will continue to have the financial capability to fully perform the work required for this contract. Any award of this contract will be made in reliance upon such certification. Upon request therefor, the bidder will submit written verification of such financial capability in a form that is acceptable to the department.

8. In accordance with Section 165 of the State Finance Law, the bidder agrees that tropical hardwoods, as defined in Section 165 of the State Finance Law, shall not be utilized in the performance of this Contract, except as the same are permitted by the foregoing provision of law.

9. The bidder has visited and examined the site of the work and has carefully examined the Contract in the form approved by the Corporation Counsel, and will execute the Contract and perform all its items, covenants and conditions, and will provide, furnish and deliver all the work, materials, supplies, tools and appliances for all labor and materials necessary or required for the hereinafter named work, all in strict conformity with the Contract, for the prices set forth in the Bid Schedule:

PROJECT ID: S216-399A

## BID SCHEDULE

**Submission:** Bidders are advised that the requirement to submit a Bid Schedule applies to the contract for which an "X" is indicated before the word "Yes". If required, the bidder must submit, with its bid, a completed Bid Schedule. Failure to provide a completed Bid Schedule may result in rejection of the bid as non-responsive.

    X     YES            NO

### Instructions for Preparing Bid Schedule:

- (A) The following bid prices on the Bid Schedule are to be paid for the actual quantities of the item numbers in the completed work or structure, and they cover the cost of all work, labor, material, tools, plant and appliances of every description necessary to complete the entire work, as specified, and the removal of all debris, temporary work and appliances.
- (B) In preparing its Bid Schedule, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, and bonds.
- (C) The Agency may reject a bid if it contains unbalanced bid prices. An unbalanced bid is considered to be one containing lump sum or unit items which do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs, anticipated for the performance of the items in question.
- (D) The bidder shall refer to section 01270, Measurement and Payment for specific explanation of Bid Schedule Items, and Attachment C, Addendum 2 for revised Article 1.02 A) of Section 01270, Measurement and Payment.

**PLEASE BE SURE A LEGIBLE BID IS ENTERED FOR EACH ITEM.**  
**THE BIDDER SHALL INSERT THE TOTAL BID PRICE ON**  
**THE BID SCHEDULE ON PAGE 13-R OF THIS BID BOOKLET**

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: Prismatic Development Corporation

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
1	Structures and Equipment – <i>items a through m</i>				
a.	General Conditions (except for Temporary Heat, Security Guards and Trailer Office) – <i>see DDC General Conditions and the Addendum to the General Conditions</i>	--	Lump Sum	Not Applicable	\$ <u>15,994,700</u>
	Temporary Heat	--	Lump Sum	Not Applicable	\$ <u>79,500</u>
	Security Guards/Fire Guards on Site	--	Lump Sum	Not Applicable	\$ <u>548,000</u>
	Trailer Office (monthly utility and service costs included)	36	Month(s)	Not Applicable	\$ <u>265,000</u>
b.	Demolition	--	Lump Sum	Not Applicable	\$ <u>1,166,000</u>
c.	Concrete	--	Lump Sum	Not Applicable	\$ <u>21,606,900</u>
d.	Masonry	--	Lump Sum	Not Applicable	\$ <u>2,212,000</u>
e.	Metals	--	Lump Sum	Not Applicable	\$ <u>12,873,600</u>
f.	Woods and Plastics	--	Lump Sum	Not Applicable	\$ <u>79,000</u>
g.	Thermal and Moisture Protection	--	Lump Sum	Not Applicable	\$ <u>6,474,700</u>
h.	Doors and Windows	--	Lump Sum	Not Applicable	\$ <u>2,309,300</u>
i.	Finishes	--	Lump Sum	Not Applicable	\$ <u>873,400</u>
j.	Specialties	--	Lump Sum	Not Applicable	\$ <u>652,800</u>
k.	Furnishings	--	Lump Sum	Not Applicable	\$ <u>71,100</u>
l.	Equipment	--	Lump Sum	Not Applicable	\$ <u>2,858,200</u>
m.	Work Not Included in Other Bid Item Categories	--	Lump Sum	Not Applicable	\$ <u>1,963,800</u>
	SUBTOTAL: Structures and Equipment – <i>items a through m</i>	--	Lump Sum	Not Applicable	\$ <u>70,027,900</u>

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: Prismatic Development Corporation

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
2	Concrete Ramp – Option 1 OR Mechanically Stabilized Earth Ramp – Option 2	<i>check selection</i> <b>X</b>	Lump Sum	Not Applicable	\$ <u>4,315,000</u>
3	Site Work and Landscaping	--	Lump Sum	Not Applicable	\$ <u>14,076,600</u>
4	Gantry Cranes and Container Transport System	--	Lump Sum	Not Applicable	\$ <u>12,576,400</u>
5	3-Year Service Agreement for Container Gantry Cranes	--	Lump Sum	Not Applicable	\$ <u>396,400</u>
6	Heating, Ventilation and Air Conditioning	--	Lump Sum	Not Applicable	\$ <u>8,480,000</u>
7	Plumbing and Fire Protection	--	Lump Sum	Not Applicable	\$ <u>2,324,600</u>
8	Electrical Work	--	Lump Sum	Not Applicable	\$ <u>17,427,400</u>
9	NOT USED	--	--	--	--
10	NOT USED	--	--	--	--
11	Hazardous Material Remediation	--	Allowance	Not Applicable	\$75,000
12	Con Edison Electrical Service Work	--	Allowance	Not Applicable	\$150,000
13	Dredging	5,500	CY	\$ <u>169</u> per CY	\$ <u>929,500</u>
14	Steel Pipe Piles, 16-inch dia.	3,100	LF	\$ <u>96.00</u> per LF	\$ <u>297,600</u>
15	Steel Pipe Piles, 20-inch dia. ---OR--- 150-Ton Composite Tapered Piles	103,400 --or-- 669	LF --or-- EA	\$ per LF --or-- \$ <u>8,500</u> each	\$ <u>5,686,500</u>
16	Steel Pipe Piles, 36-inch dia.: For Concrete Ramp – Option 1 ---OR--- For Mechanically Stabilized Earth Ramp – Option 2 <i>Option selection must match ramp option selected in Bid Item 2</i>	5,800 --or-- 4,000	LF	\$ per LF --or-- \$ <u>500.00</u> per LF	\$ <u>2,000,000</u>

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: Prismatic Development Corporation

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
17	Pile Driving Analyzer Load Tests - Steel Pipe Piles	50	EA	\$1,500.00 each	\$ 75,000.00
18	Compression Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$52,000.00 each	\$ 260,000.00
19	Compression Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$82,000.00 each	\$ 164,000.00
20	Lateral Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$42,000.00 each	\$ 210,000.00
21	Lateral Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$42,000.00 each	\$ 84,000.00
22	Marine Timber Piles	850	LF	\$56.00 per LF	\$47,600.00
23	Concrete Spall Repair - Shallow	100	SF	\$125.00 per SF	\$12,500.00
24	Concrete Spall Repair - Deep	100	CF	\$650.00 per CF	\$65,000.00
25	Concrete Crack Repair - Type A	500	LF	\$75.00 per LF	\$37,500.00
26	Concrete Crack Repair - Type B	200	LF	\$105.00 per LF	\$21,000.00
27	Concrete Crack Repair - Type C	100	LF	\$115.00 per LF	\$11,500.00
28	Additional Earth Excavation	500	CY	\$65.00 per CY	\$ 32,500.00
29	Additional Select Fill	100	CY	\$90.00 per CY	\$ 9,000.00
30	Additional Common Fill	100	CY	\$75.00 per CY	\$ 7,500.00
				TOTAL BID ITEMS 1 through 30	\$ 139,800,000



**BID FORM**

**PROJECT ID: S216-399A**

**TOTAL BID PRICE:** In the space provided below, the Bidder shall indicate the total bid price in figures.

Total Price for all work

\$ 139,800,000

KL  
11/20/12

**BIDDER'S SIGNATURE AND AFFIDAVIT**

**WARNING!!** Failure to comply with items below will result in the rejection of your bid.

- \* **SUBCONTRACTORS:** You MUST complete and submit the form entitled "Bidder's Identification of Subcontractors" (See Page 17) at the time you submit your bid. You must submit this form in a separate, sealed envelope (BID ENVELOPE #2). In the event an award of contract is not made to the Bidder, the Bidder hereby authorizes the Agency to shred the form entitled "Bidder's Identification of Subcontractors".   X   Yes  
           No

- \* **MWBE GOALS:** You MUST complete and submit the Affirmations contained in the Subcontractor Utilization Plan (See Page 7), or a pre-approved waiver (See Page 9), at the time you submit your bid. You must submit the Affirmations (or a pre-approved waiver) in BID ENVELOPE #1.

Bidder: Prismatic Development Corporation

By:

(Signature of Partner or corporate officer)

Robert V. Gamba  
President / C.E.O.

Attest:

(Corporate Seal)

Secretary of Corporate Bidder David A. Temeles

Affidavit on the following page should be subscribed  
and sworn to before a Notary Public

**BID FORM (TO BE NOTARIZED)**

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS AN INDIVIDUAL**

STATE OF NEW YORK, COUNTY OF \_\_\_\_\_ ss:

being duly sworn says:

I am the person described in and who executed the foregoing bid, and the several matters therein stated are in all respects true.

\_\_\_\_\_  
(Signature of the person who signed the Bid)

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Notary Public

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS A PARTNERSHIP**

STATE OF NEW YORK, COUNTY OF \_\_\_\_\_ ss:

being duly sworn says:

I am a member of \_\_\_\_\_ the firm described in and which executed the foregoing bid.  
subscribed the name of the firm thereto on behalf of the firm, and the several matters therein stated are in all respects true.

\_\_\_\_\_  
(Signature of Partner who signed the Bid)

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Notary Public

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS A CORPORATION**

New Jersey  
STATE OF ~~NEW YORK~~, COUNTY OF \_\_\_\_\_ Essex ss:

Robert V. Gamba being duly sworn says:

I am the President of the above named corporation whose name is subscribed to and which executed  
the foregoing bid. I reside at 60 Beachmont Terrace, North Caldwell, NJ 07006.  
I have knowledge of the several matters therein stated, and they are in all respects true.

\_\_\_\_\_  
(Signature of Corporate Officer who signed the Bid)  
Robert V. Gamba

Subscribed and sworn to before me this  
20th day of November, 2012

Karen A. Meyer  
Notary Public  
KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

## AFFIRMATION

The undersigned bidder affirms and declares that said bidder is not in arrears to the City of New York upon debt, contract or taxes and is not a defaulter, as surety or otherwise, upon obligation to the City of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except none

(If none, the bidder shall insert the word "None" in the space provided above.)

Full Name of Bidder: Prismatic Development Corporation

Address: 60 US Highway 46

City: Fairfield

State: NJ

Zip Code: 07004

CHECK ONE BOX AND INCLUDE APPROPRIATE NUMBER:

☐

A - Individual or Sole Proprietorship \*  
SOCIAL SECURITY NUMBER

☐

B - Partnership, Joint Venture or other unincorporated organization  
EMPLOYER IDENTIFICATION NUMBER

☒

C - Corporation  
EMPLOYER IDENTIFICATION NUMBER

22-2433095

By: \_\_\_\_\_

Signature: \_\_\_\_\_

Robert V. Gamba

Title: President / C.E.O.

If a corporation, place seal here

This affirmation must be signed by an officer or duly authorized representative.

\* Under the Federal Privacy Act the furnishing of Social Security Numbers by bidders on City contracts is voluntary. Failure to provide a Social Security Number will not result in a bidder's disqualification. Social Security Numbers will be used to identify bidders, proposers or vendors to ensure their compliance with laws, to assist the City in enforcement of laws, as well as to provide the City a means of identifying of businesses which seek City contracts.

## **BIDDER'S IDENTIFICATION OF SUBCONTRACTORS**

Project ID: S216-399A

**SUBMISSION:** In addition to its Bid (Bid Envelope # 1), the Bidder must, at the time of the bid, complete and submit this form in a separate, sealed envelope (Bid Envelope # 2). To complete this form, the Bidder must identify the subcontractors it intends to use for the work listed below, as well as the dollar amount to be paid to each subcontractor. Failure to complete this form and submit it in a separate, sealed envelope will result in the disqualification of the bid as non-responsive.

The Bidder intends to use the following subcontractors. If the Bidder intends to do any of the work referenced below with its own forces, the Bidder should complete this form using its own name. If multiple subcontractors for any trade are proposed, Bidder may submit multiple copies of this form.

1. **PLUMBING CONTRACTOR:**

4J's Plumbing  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ 2,193,000

2. **HVAC CONTRACTOR:**

C. D. E. Air conditioning Company Inc.  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ 8,000,000

3. **ELECTRICAL CONTRACTOR:**

Tru - Val Electric  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ 15,900,000

**BIDDER'S SIGNATURE:** The Bidder must sign this form in the space provided below:

Name of Bidder: Prismatic Development Corporation

By:   
Signature of Partner or Corporate Officer

Print Name: Robert V. Gamba

Title: President / C.E.O.

**PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

<b>JOB NAME &amp; CONTRACT DESCRIPTION</b>	<b>OWNER</b>	<b>VALUE OF CONTRACT</b>	<b>PERCENTAGE COMPLETED</b>	<b>COMPLETION DATE</b>
140 Mayhill Parking Structure Mayhill Street, Saddle Brook, NJ	Saddle Brook Mayhill Associates LLC 1122 Clifton Avenue Clifton, NJ (973) 473-2800	\$7,943,800	100%	January, 2009
Yankee Parking Facility Concrete Work	Bronx Parking Development Co. LLC 18 Aitken Avenue Hudson, NY 12534	\$29,000,000	100%	March, 2010
Red Bulls Stadium - Concrete	Red Bull New York One Harmon Plaza, 3rd Floor Secaucus, NJ 07094 (201) 583-7004	\$9,000,000. +/-	100%	December, 2008
North Shore Marine Transfer Station Flushing, NY Contract #4G - Structures & Equipment	The City of New York Dept. of Sanitation 44 Beaver St., 7th Floor, NY, NY 10004 Brij Shrivastava (212) 437-4520	\$161,195,000	90%	March, 2013
Hamilton Avenue Marine Transfer Station Brooklyn, NY Contract #1G - Structures & Equipment Contract by Prismatic-J.H. Reid Jt. Venture	The City of New York Dept. of Sanitation 44 Beaver St., 7th Floor, NY, NY 10004 Brij Shrivastava (212) 437-4520	\$142,000,000	70%	August, 2013

**PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

<b>JOB NAME &amp; CONTRACT DESCRIPTION</b>	<b>OWNER</b>	<b>VALUE OF CONTRACT</b>	<b>PERCENTAGE COMPLETED</b>	<b>COMPLETION DATE</b>
LIRR Mineola Intermodal Center Design/Build Parking Garage and Pedestrian Bridge Mineola, New York	MTA Long Island Railroad 90-27 Sutphin Boulevard Jamaica, New York 11435 Richard Mack (718) 386-0480	\$22,800,000	100%	November 2006
Essex County Hospital Cedar Grove, New Jersey	Essex County Improvement Authority 465 Martin Luther King Boulevard Newark, New Jersey 07102 Dennis Sedaile (973) 226-8500	\$58,300,000	100%	December 2006
Addition & Alteration to Preakness Health Care Center Wayne, New Jersey	County of Passaic 401 Grand Street Paterson, NJ 07505 (973) 881-4000	\$37,480,000	100%	August, 2009
New Elementary School Elizabeth School #27 Elizabeth, New Jersey	Bovis Lend Lease 288 North Broad Street Elizabeth, New Jersey 07208 (908) 354-3600	\$35,635,000	100%	August, 2008
Terminal B - Newark International Airport Modernization Connector Expansions Newark, NJ EWR-254.003	The Port Authority of NY & NJ 1 Madison Avenue New York, NY 10010 Caesar Johnson (973) 261-2289	\$69,800,000	100%	February, 2011
New Elementary School PS#3 West New York, NJ HU-0006-C02	NJ Schools Development Authority 1 West State Street, Trenton, NJ 08625 Corrado Minervini (973) 648-4029	\$45,300,000	100%	March, 2012
Yankee Stadium Parking Facilities Bronx, NY Design-Build Garages A, B & C and Parkland on roof of Garage A Contract by Prismatic-Hunter Roberts Jt. Venture	Bronx Parking Development Co. LLC 18 Aitken Avenue, Hudson, NY 12534 / NY EDC, NYC Parks & Recreation Frank McCue (718) 760-6676	\$275,000,000	100%	March, 2010

**PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

<b>JOB NAME &amp; CONTRACT DESCRIPTION</b>	<b>OWNER</b>	<b>VALUE OF CONTRACT</b>	<b>PERCENTAGE COMPLETED</b>	<b>COMPLETION DATE</b>
NJT Montclair State University Design/Build Rail Station & Parking Deck	NJ Transit 1 Penn Plaza East, 6th Floor Newark, NJ 07105 Steve Ardelli (973) 491-7468	\$28,200,000	100%	September 2004
West New York - New Middle School West New York, NJ	NJ Schools Development Authority 1 West State Street, Trenton, NJ 08625 Corrado Minervini (973) 648-4029	\$29,794,000	100%	August 2004
Essex County Sportsplex Construction of Newark Bears Parking Garage	County of Essex Hall of Records, Room 325 Newark, NJ 07102 Kevin Galland (973) 621-5100	\$6,876,000	100%	August 2004
Elizabeth New PK-8 School #29	NJ Schools Development Authority 1 West State Street, Trenton, NJ 08625 Gary Cleveland (609) 943-5955	\$31,250,000	100%	March 2006
Elizabeth New PK-8 School #31	NJ Schools Development Authority 1 West State Street, Trenton, NJ 08625 Gary Cleveland (609) 943-5955	\$33,689,000	100%	May 2006
West New York - Public School No. 4 West New York, New Jersey	NJ Schools Development Authority 1 West State Street, Trenton, NJ 08625 Corrado Minervini (973) 648-4029	\$25,400,000	100%	June, 2007

# **PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

<b>JOB NAME &amp; CONTRACT DESCRIPTION</b>	<b>OWNER</b>	<b>VALUE OF CONTRACT</b>	<b>PERCENTAGE COMPLETED</b>	<b>COMPLETION DATE</b>
Whitehall Ferry Terminal Concrete Work Manhattan, NY	NYC Economic Development Corporation 110 William Street New York, NY 10038 (212) 619-5000	\$2,747,000	100%	November 2004
Essex County Correctional Facility Support Building Newark, NJ	Essex County Improvement Authority 29 Wright Way Fairfield, NJ 07004 James Paganelli (973) 575-0952	\$31,200,000	100%	December 2003
Rehabilitation & Superstructure of Building 1 Newark International Airport Newark, NJ	The Port Authority of NY & NJ 1 Madison Avenue New York, NY 10010 Brian Hegarty (212) 435-7000	\$50,700,000	100%	April 2002
Essex County Correctional Facility Housing Bldgs. 2, 3 & 4, GC Package Newark, NJ	Essex County Improvement Authority 29 Wright Way Fairfield, NJ 07004 James Paganelli (973) 575-0952	\$17,800,000	100%	December 2003
Holland Tunnel Arch. & Struct. Rehab. of NJ Ventilation Bldgs., Jersey City, NJ	The Port Authority of NY & NJ 1 Madison Avenue New York, NY 10010 Ivan Kubicek (212) 435-7000	\$14,355,980	100%	March 2004
Little Falls Water Treatment Plant Upgrade Passaic Valley Water Commission Passaic County, NJ	Passaic County Water Commission 1525 Main Street Clifton, NJ 07105 Jim Duprey (973) 340-4300	\$65,829,140	100%	September 2004



**PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

<b>JOB NAME &amp; CONTRACT DESCRIPTION</b>	<b>OWNER</b>	<b>VALUE OF CONTRACT</b>	<b>PERCENTAGE COMPLETED</b>	<b>COMPLETION DATE</b>
Bergen County Jail Annex Hackensack, NJ	County of Bergen Admin. Bldg. Court Plaza South 21 Main Street Hackensack, NJ 07601-7000 (201) 646-2560 Anthony Scalpino, Dep Dir of Pub. Works	\$18,960,600	100%	March 2003
Essex County Sportsplex Bridge Street Stadium, Newark, NJ	Essex County Improvement Authority 29 Wright Way, Fairfield, NJ 07004 (973) 575-0952	\$14,620,000	100%	December 1999
East Orange Campus High School East Orange, NJ	East Orange School District 715 Park Ave., E. Orange, NJ 07017 (973) 266-5700 CM - Christa Construction, Inc. Ray Hanson / Superintendent (973) 672-6710	\$19,792,200	100%	December 2001
Bldg. 1 Foundation & Bldg. 51 Relocation at Newark International Airport	The Port Authority of NY & NJ 1 Madison Avenue New York, NY 10010 Brian Hegarty (212) 435-7000	\$13,200,000	100%	June 2001
Plainfield Rail Station Plainfield, NJ	NJ Transit One Penn Plaza East Newark, NJ 07105-2246 (973) 491-7000	\$7,593,677	100%	June 2002
Continental Airlines Newark International Airport Design/Build Parking Garage & Pedestrian Bridges Terminal C	Continental Airlines Corporate Real Estate Newark Liberty Int'l Airport, Term C Newark, NJ 07114 Caesar Johnson (973) 261-2289	\$81,847,000	100%	April 2002

# **PRISMATIC DEVELOPMENT CORPORATION WORK STATUS**

JOB NAME & CONTRACT DESCRIPTION	OWNER	VALUE OF CONTRACT	PERCENTAGE COMPLETED	COMPLETION DATE
Dover Train Storage Yard Dover, NJ	NJ Transit Corporation 1 Penn Plaza E., Newark, NJ James Mills (973) 491-7474	\$6,240,000	100%	January 1997
NJ Transit Gateway Transit Hub & Wilson Street Extension, Jersey City, NJ	NJ Transit Corporation 1 Penn Plaza East, Newark, NJ Richard Mack (973) 491-7467	\$11,233,992	100%	December 1998
The Port Authority Consolidated Maint. Fac. Waldo Yard, Jersey City, NJ	The Port Authority of NY & NJ 1 Madison Avenue New York, NY 10010 Ron Gumann, Resident Engineer (201) 216-2703	\$11,000,000	100%	December 1997
Westfield Rail Station NJ Transit High Level Platform Construction	NJ Transit Corporation 1 Penn Plaza East, Newark, NJ James Mills (973) 491-7474	\$6,149,200	100%	April 1998
Holland Tunnel Architectural & Structural Rehab.	The Port Authority of NY & NJ 1 World Trade Center New York, NY 10048 Ron Gumann, Resident Engineer (201) 216-2703	\$8,813,000	100%	February 1999
Orange County Correctional Facility Goshen, NY	County of Orange Rt. 17M Goshen, NY 10924 Ed Fares (845) 291-2750	\$50,834,735	100%	October 2000
Matawan Rail Station NJ Transit High Level Platform Construction Matawan, NJ	NJ Transit One Penn Plaza East Newark, NJ 07105-2246 (973) 491-7000	\$7,113,378	100%	February 2000

BID BOND 1  
FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS. That we,  
60 US Highway 46, Fairfield, NJ 07004

Prismatic Development Corp.

hereinafter referred to as the "Principal", and Zurich American Insurance Company  
300 Interpace Parkway, Morris Corp. I, Parsippany, NJ 07054

hereinafter referred to as the "Surety" are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "CITY", or to its successors and assigns in the penal sum of Ten Percent of the  
Amount Bid

(\$---10%---), Dollars lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the Principal is about to submit (or has submitted) to the City the accompanying proposal, hereby made a part hereof, to enter into a contract in writing for Southwest Brooklyn Marine

Transfer Station, FMS No. S216-399A

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall not withdraw said Proposal without the consent of the City for a period of forty-five (45) days after the opening of bids and in the event of acceptance of the Principal's Proposal by the City, if the Principal shall:

(a) Within ten (10) days after notification by the City, execute in quadruplicate and deliver to the City all the executed counterparts of the Contract in the form set forth in the Contract Documents, in accordance with the proposal as accepted, and

(b) Furnish a performance bond and separate payment bond, as may be required by the City, for the faithful performance and proper fulfillment of such Contract, which bonds shall be satisfactory in all respects to the City and shall be executed by good and sufficient sureties, and

(c) In all respects perform the agreement created by the acceptance of said Proposal as provided in the Information for Bidders, bound herewith and made a part hereof, or if the City shall reject the aforesaid Proposal, then this obligation shall be null and void; otherwise to remain in full force and effect.

## BID BOND 2

In the event that the Proposal of the Principal shall be accepted and the Contract be awarded to him the Surety hereunder agrees subject only to the payment by the Principal of the premium therefore, if requested by the City, to write the aforementioned performance and payment bonds in the form set forth in the Contract Documents.

It is expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

There shall be no liability under this bond if, in the event of the acceptance of the Principal's Proposal by the City, either a performance bond or payment bond, or both, shall not be required by the City on or before the 30th day after the date on which the City signs the Contract.

The surety, for the value received, hereby stipulates and agrees that the obligations of the Surety and its bond shall in no way be impaired or affected by any postponements of the date upon which the City will receive or open bids, or by any extensions of time within which the City may accept the Principal's Proposal, or by any waiver by the City of any of the requirements of the Information for Bidders, and the Surety hereby waives notice of any such postponements, extensions, or waivers.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers the 20th day of November, 2012.

(Seal)

Prismatic Development Corp.

(L.S.)

Principal

By:

Robert V. Gamba, President/C.E.O.

(Seal)

Zurich American Insurance Company

Surety

By:

Robert B. Pitts, Attorney-in-Fact

## BID BOND 3

ACKNOWLEDGEMENT OF PRINCIPAL IF A CORPORATION

State of NJ County of Essex ss:  
 On this 20th day of November, 2012, before me personally came  
Robert V. Gamba to me known, who, being by me duly sworn, did depose and say that he  
 resides at 60 Beachmont Terrace, North Caldwell, NJ  
 that he is the President/C.E.O. of Prismatic Development Corporation  
 the corporation described in and which executed the foregoing instrument; that he knows the seal of said  
 corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the  
 directors of said corporation, and that he signed his name thereto by like order.

KAREN A. MEYER  
 NOTARY PUBLIC OF NEW JERSEY  
 My Commission Expires April 5, 2014

*Karen A. Meyer*  
 Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL IF A PARTNERSHIP

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:  
 On this \_\_\_\_\_ day of \_\_\_\_\_, before me personally appeared  
 \_\_\_\_\_ to me known and known to me to be one of the members of the firm of  
 \_\_\_\_\_ described in and who executed the foregoing instrument, and he  
 acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
 Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL IF AN INDIVIDUAL

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:  
 On this \_\_\_\_\_ day of \_\_\_\_\_, before me personally appeared  
 \_\_\_\_\_ to me known and known to me to be the person described in and who  
 executed the foregoing instrument and acknowledged that he executed the same.

\_\_\_\_\_  
 Notary Public

## AFFIX ACKNOWLEDGEMENTS AND JUSTIFICATION OF SURETIES

**SURETY ACKNOWLEDGMENT**

State of New Jersey

County of Somerset

On the 20th day of November 2012 before me, the undersigned Notary Public, in and for the State, personally appeared Robert B. Pitts personally known to me (or proved to me basis of satisfactory evidence), to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity, and that by his/her signature or the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

Given under my hand and Notarial Seals this 20th day of November 2012.

**ANN MARIE KEANE**  
**NOTARY PUBLIC OF NEW JERSEY**  
**MY COMMISSION EXPIRES MAY 19, 2015**

Commission Expires

*A. Marie Keane*  
Ann Marie Keane  
Notary Public

# ZURICH AMERICAN INSURANCE COMPANY

## POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, that the ZURICH AMERICAN INSURANCE COMPANY, a corporation created by and existing under the laws of the State of New York does hereby nominate, constitute and appoint **A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, Frederick E. NICHOLSON, Theresa J. FOLEY, Robert S. RAPP JR., Joseph T. CHARCZENKO and AnnMarie KEANE**, all of Branchburg, New Jersey, EACH its true and lawful Attorneys-In-Fact with power and authority hereby conferred to sign, seal, and execute in its behalf, during the period beginning with the date of issuance of this power, : **any and all bonds and undertakings, recognizances or other written obligations in the nature thereof**, and to bind ZURICH AMERICAN INSURANCE COMPANY thereby, and all of the acts of said Attorney[s]-in-Fact pursuant to these presents are hereby ratified and confirmed. This Power of Attorney is made and executed pursuant to and by the authority of the following By-Law duly adopted by the Board of Directors of the Company which By-Law has not been amended or rescinded:

Article VI, Section 5. "...The President or a Vice President in a written instrument attested by a Secretary or an Assistant Secretary may appoint any person Attorney-In-Fact with authority to execute surety bonds on behalf of the Company and other formal underwriting contracts in reference thereto and reinsurance agreements relating to individual policies and bonds of all kinds and attach the corporate seal. Any such officers may revoke the powers granted to any Attorney-In-Fact."

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY by unanimous consent in lieu of a special meeting dated December 15, 1998

" RESOLVED, that the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the seal of the Company may be affixed by facsimile on any Power of Attorney pursuant to Article VI, Section 5 of the By-Laws, and the signature of a Secretary or an Assistant Secretary and the seal of the Company may be affixed by facsimile to any certificate of any such power. Any such power or any certificate thereof with such facsimile signature and seal shall be valid and binding on the Company. Furthermore, such power so executed, sealed and certified by certificate so executed and sealed shall, with respect to any bond or undertaking to which it is attached, shall continue to be valid and binding on the Company."

IN WITNESS WHEREOF, the ZURICH AMERICAN INSURANCE COMPANY has caused these presents to be executed in its name and on its behalf and its Corporate Seal to be hereunto affixed and attested by its officers thereunto duly authorized, this **26th day of July, A.D. 2011**. This power of attorney revokes that issued on behalf of A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, AnnMarie KEANE, dated February 1, 2010.



## ZURICH AMERICAN INSURANCE COMPANY

*Gregory E. Murray*

*Frank E. Martin Jr.*

STATE OF MARYLAND }  
CITY OF BALTIMORE }

ss:

*Gregory E. Murray*

Secretary

By:

*Frank E. Martin Jr.*

Vice President

On the 26th day of July, A.D. 2011, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, came the above named Vice President and Secretary of ZURICH AMERICAN INSURANCE COMPANY, to me personally known to be the individuals and officers described in and who executed the preceding instrument and they each acknowledged the execution of the same and being by me duly sworn, they severally and each for himself deposed and said that they respectively hold the offices in said Corporation as indicated, that the Seal affixed to the preceding instrument is the Corporate Seal of said Corporation, and that the said Corporate Seal, and their respective signature as such officers, were duly affixed and subscribed to the said instrument pursuant to all due corporate authorization.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above.



*Constancia A. Duvon*

Notary Public

My Commission Expires: July 14, 2015

This Power of Attorney limits the acts of those named therein to the bonds and undertaking specifically named therein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

## CERTIFICATE

I, the undersigned, a Secretary of the ZURICH AMERICAN INSURANCE COMPANY, do hereby certify that the foregoing Power of Attorney is still in full force and effect, and further certify that Article VI, Section 5 of the By-Laws of the Company and the Resolution of the Board of Directors set forth in said Power of Attorney are still in force.

IN TESTIMONY WHEREOF I have hereto subscribed my name and affixed the seal of said Company

*Gerald F. Haley*

the 20th day of November 2012

Gerald F. Haley

Secretary



**ZURICH AMERICAN INSURANCE COMPANY**  
**COMPARATIVE BALANCE SHEET**  
**ONE LIBERTY PLAZA, 165 BROADWAY, 32nd FLOOR, NEW YORK, NY 10006**  
**As of December 31, 2011 and December 31, 2010**

	12/31/2011	12/31/2010
<b>Assets</b>		
Bonds	\$ 18,985,096,131	\$ 18,919,367,229
Preferred Stock	259,036	881,155
Common Stock	2,068,881,919	2,164,868,224
Real Estate	-	-
Other Invested Assets	2,065,634,039	2,064,283,585
Short-term Investments	107,298,374	201,721,691
Receivable for securities	18,523,294	-
Cash and cash equivalents	(128,716,627)	295,413,702
Securities lending reinvested collateral assets	120,821,061	355,288,472
Employee Trust for Deferred Compensation Plan	124,809,033	123,641,790
Total Cash and Invested Assets	<u>\$ 23,362,606,260</u>	<u>\$ 24,125,465,848</u>
Premiums Receivable	\$ 3,611,868,304	\$ 3,435,875,097
Funds Held with Reinsurers	28,073,922	62,508,828
Reinsurance Recoverable	233,357,918	217,412,579
Accrued Investment Income	149,372,442	155,412,983
Federal Income Tax Recoverable	788,664,462	864,441,400
Due from Affiliates	95,583,016	84,104,105
Other Assets	459,639,011	475,167,605
Total Assets	<u>\$ 28,729,165,335</u>	<u>\$ 29,420,388,445</u>
<b>Liabilities and Policyholders' Surplus</b>		
<b>Liabilities:</b>		
Loss and LAE Reserves	\$ 14,401,632,170	\$ 14,303,526,826
Unearned Premium Reserve	4,066,273,586	4,266,385,678
Funds Held with Reinsurers	218,214,563	220,452,519
Loss In Course of Payment	353,274,509	326,096,480
Commission Reserve	63,749,920	129,070,777
Federal Income Tax Payable	47,352,138	53,201,046
Remittances and Items Unallocated	69,677,903	47,400,078
Payable to parent, subs and affiliates	92,111,683	130,008,907
Provision for Reinsurance	60,498,188	64,548,922
Ceded Reinsurance Premiums Payable	278,235,370	138,866,405
Securities Lending Collateral Liability	120,821,061	356,743,459
Other Liabilities	1,938,544,837	2,009,922,767
Total Liabilities	<u>\$ 21,710,385,928</u>	<u>\$ 22,046,223,864</u>
<b>Policyholders' Surplus:</b>		
Common Capital Stock	\$ 5,000,000	\$ 5,000,000
Paid-In and Contributed Surplus	4,394,131,320	4,394,131,321
Surplus Notes	883,000,000	1,533,000,000
Special Surplus Retroactive Reinsurance	55,544,000	96,392,000
Change in Net Deferred Tax Asset	340,894,437	321,550,097
Cumulative Unrealized Gain	209,454,958	132,165,276
Dividends Undeclared	-	-
Loss Portfolio Transfer Account	-	-
Unassigned Surplus	1,130,754,692	891,925,887
Total Policyholders' Surplus	<u>\$ 7,018,779,407</u>	<u>\$ 7,374,164,581</u>
Total Liabilities and Policyholders' Surplus	<u>\$ 28,729,165,335</u>	<u>\$ 29,420,388,445</u>

I, Dennis F. Kerrigan, Corporate Secretary of ZURICH AMERICAN INSURANCE COMPANY do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company, on the 31st day of December, 2011, according to the best of my information, knowledge and belief.

State of Illinois  
County of Cook

} SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2012.

OFFICIAL SEAL  
DARRYL JOINER  
Notary Public - State of Illinois  
My Commission Expires May 3, 2014

Corporate Secretary

Notary public

November 20, 2012



## SAFETY QUESTIONNAIRE

The bidder must include, with its bid, all information requested on this Safety Questionnaire. Failure to provide a completed and signed Safety Questionnaire at the time of bid opening may result in disqualification of the bid as non-responsive.

### 1. Bidder Information:

Company Name: Prismatic Development Corporation

DDC Project Number: S216-399A

Company Size:            Ten (10) employees or less  
           ☒ Greater than ten (10) employees

           Company has previously worked for DDC

### 2. Type(s) of Construction Work

TYPE OF WORK	LAST 3 YEARS	THIS PROJECT
General Building Construction	<u>          X          </u>	<u>          X          </u>
Residential Building Construction	<u>                          </u>	<u>                          </u>
Nonresidential Building Construction	<u>          X          </u>	<u>                          </u>
Heavy Construction, except building	<u>                          </u>	<u>                          </u>
Highway and Street Construction	<u>                          </u>	<u>                          </u>
Heavy Construction, except highways	<u>                          </u>	<u>                          </u>
Plumbing, Heating, HVAC	<u>                          </u>	<u>                          </u>
Painting and Paper Hanging	<u>                          </u>	<u>                          </u>
Electrical Work	<u>                          </u>	<u>                          </u>
Masonry, Stonework and Plastering	<u>                          </u>	<u>                          </u>
Carpentry and Floor Work	<u>          X          </u>	<u>          X          </u>
Roofing, Siding, and Sheet Metal	<u>                          </u>	<u>                          </u>
Concrete Work	<u>                          </u>	<u>                          </u>
Specialty Trade Contracting	<u>                          </u>	<u>                          </u>
Asbestos Abatement	<u>                          </u>	<u>                          </u>
Other (specify)	<u>                          </u>	<u>                          </u>

### 3. Experience Modification Rate:

The Experience Modification Rate (EMR) is a rating generated by the National Council of Compensation Insurance (NCCI). This rating is used to determine the contractor's premium for worker's compensation insurance. The contractor may obtain its EMR by contacting its insurance broker or the NCCI. If the contractor cannot obtain its EMR, it must submit a written explanation as to why.

The Contractor must indicate its Intrastate and Interstate EMR for the past three years. [Note: For contractors with less than three years of experience, the EMR will be considered to be 1.00].

YEAR	<u>INTRASTATE RATE</u>	<u>INTERSTATE RATE</u>
<u>10</u>	<u>800</u>	<u>662</u>
<u>11</u>	<u>760</u>	<u>864</u>
<u>12</u>	<u>830</u>	<u>830</u>

If the Intrastate and/or Interstate EMR for any of the past three years is greater than 1.00, the contractor must attach, to this questionnaire, a written explanation for the rating and identify what corrective action was taken to correct the situation resulting in that rating.

**4. OSHA Information:**

No Contractor has received a willful violation issued by OSHA or New York City Department of Buildings (NYCDOB) within the last three years.

No Contractor has had an incident requiring OSHA notification within 8 hours (i.e., fatality, or hospitalization of three or more employees).

The Occupational Safety and Health Act (OSHA) of 1970 requires employers with ten or more employees, on a yearly basis to complete and maintain on file the form entitled "Log of Work-related Injuries and Illnesses". This form is commonly referred to as the OSHA 300 Log (OSHA 200 Log for 2001 and earlier).

The OSHA 300 Log must be submitted for the last three years for contractors with more than ten employees.

The Contractor must indicate the total number of hours worked by its employees, as reflected in payroll records for the past three years.

The contractor must submit the Incident Rate for Lost Time Injuries (the Incident Rate) for the past three years. The Incident Rate is calculated in accordance with the formula set forth below. For each given year, the total number of incidents is the total number of non-fatal injuries and illnesses reported on the OSHA 300 Log. The 200,000 hours represents the equivalent of 100 employees working forty hours a week, fifty weeks per year.

$$\text{Incident Rate} = \frac{\text{Total Number of Incidents} \times 200,000}{\text{Total Number of Hours Worked by Employees}}$$

YEAR	TOTAL NUMBERS OF HOURS WORKED BY EMPLOYEES	INCIDENT RATE
<u>10</u>	<u>116,963</u>	<u>0</u>
<u>11</u>	<u>129,106</u>	<u>3.09</u>
<u>12</u>	<u>122,286</u>	<u>8.17</u>

If the contractor's Incident Rate for any of the past three years is one point higher than the Incident Rate for the type of construction it performs (listed below), the contractor must attach, to this questionnaire, a written explanation for the relatively high rate.

General Building Construction	8.5
Residential Building Construction	7.0
Nonresidential Building Construction	10.2
Heavy Construction, except building	8.7
Highway and Street Construction	9.7
Heavy Construction, except highways	8.3
Plumbing, Heating, HVAC	11.3
Painting and Paper Hanging	6.9
Electrical Work	9.5
Masonry, Stonework and Plastering	10.5
→ Carpentry and Floor Work	12.2
Roofing, Siding, and Sheet Metal	10.3
Concrete Work	8.6
Specialty Trade Contracting	8.6

##### 5. Safety Performance on Previous DDC Project(s)

no Contractor previously audited by the DDC Office of Site Safety.

DDC Project Number(s): \_\_\_\_\_

no Accident on previous DDC Project(s).

no Fatality or Life-altering Injury on DDC Project(s) within the last three years.  
[Examples of a life-altering injury include loss of limb, loss of a sense (e.g., sight, hearing), or loss of neurological function].

Date: March 20, 2013

By: \_\_\_\_\_

(Signature of Owner, Partner, Corporate Officer)

David A. Temeles

Title: Executive Vice President

**BIDDER'S CERTIFICATION OF COMPLIANCE WITH  
IRAN DIVESTMENT ACT**

Pursuant to General Municipal Law §103-g, which generally prohibits the City from entering into contracts with persons engaged in investment activities in the energy sector of Iran, the bidder/proposer submits the following certification:

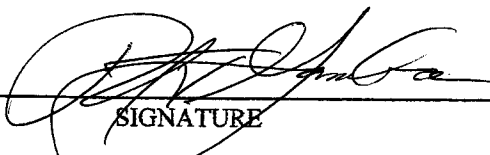
[Please Check One]

**BIDDER'S CERTIFICATION**

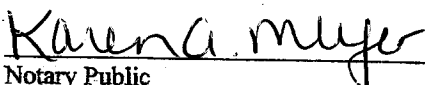
☒ By submission of this bid or proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief, that each bidder/proposer is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law.

☐ I am unable to certify that my name and the name of the bidder/proposer does not appear on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law. I have attached a signed statement setting forth in detail why I cannot so certify.

Dated: 20th ~~New York~~ New Jersey  
November, 20 12

  
\_\_\_\_\_  
SIGNATURE  
  
Robert V. Gamba  
\_\_\_\_\_  
PRINTED NAME  
  
President  
\_\_\_\_\_  
TITLE

Sworn to before me this  
20th day of Nov., 20 12

  
\_\_\_\_\_  
Notary Public

Dated: November 20, 2012

KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

# Certificate of No Change Form

- Please fill in all the fields and DO NOT leave any field blank.
- Please submit two completed forms. Copies will not be accepted.
- Please send both copies to the agency that requested it, unless you are advised to send it directly to the Mayor's Office of Contract Services (MOCS).
- A materially false statement willfully or fraudulently made in connection with this certification, and/or the failure to conduct appropriate due diligence in verifying the information that is the subject of this certification, may result in rendering the submitting entity non-responsible for the purpose of contract award.
- A materially false statement willfully or fraudulently made in connection with this certification may subject the person making the false statement to criminal charges

I, David A. Temeles, being duly sworn, state that I have read  
*Enter Your Name*

and understand all the items contained in the vendor questionnaire and any submission of change as identified on page one of this form and certify that as of this date, these items have not changed. I further certify that, to the best of my knowledge, information and belief, those answers are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate.

In addition, I further certify on behalf of the submitting vendor that the information contained in the principal questionnaire(s) and any submission of change identified on page two of this form have not changed and have been verified and continue, to the best of my knowledge, to be full, complete and accurate.

I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

## Vendor Questionnaire *This section is required.*

*This refers to the vendor questionnaire(s) submitted for the vendor doing business with the City.*

Name of Submitting Entity: Prismatic Development Corporation

Vendor's Address: 60 Route 46, Fairfield, NJ 07004

Vendor's EIN or TIN: 22-2433095 Requesting Agency: DDC

Are you submitting this Certification as a parent? (Please circle one) Yes ☒ No

Signature date on the last full vendor questionnaire signed by the submitting vendor: 9/20/13

Signature date on changed submission, if applicable, for the submitting vendor: 1/23/14

# Principal Questionnaire

This section refers to the most recent principal questionnaire submissions.



Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on Changed Submission (if applicable)
<sup>1</sup> Robert V. Gamba	9/20/13	
<sup>2</sup> David A. Temeles	9/20/13	
<sup>3</sup> Carol Gamba	10/10/13	
<sup>4</sup>		
<sup>5</sup>		
<sup>6</sup>		

☐ Check if additional changes were submitted and attach a document with the date of additional submissions.

## Certification *This section is required.*

*This form must be signed and notarized. Please complete this twice. Copies will not be accepted.*

### Certified By:

David A. Temeles

Name (Print)

Executive Vice President

Title

Prismatic Development Corporation

Name of Submitting Entity

Signature

Date

1/27/14

### Notarized By:

Notary Public

County License Issued

License Number

Sworn to before me on:

Date

1-27-14

KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

Mayor's Office of Contract Services  
253 Broadway, 9th Floor New York, NY 10007  
Phone: 212-788-0010 Fax: 212-788-0049

# Certificate of No Change Form

- Please fill in all the fields and DO NOT leave any field blank.
- Please submit two completed forms. Copies will not be accepted.
- Please send both copies to the agency that requested it, unless you are advised to send it directly to the Mayor's Office of Contract Services (MOCS).
- A materially false statement willfully or fraudulently made in connection with this certification, and/or the failure to conduct appropriate due diligence in verifying the information that is the subject of this certification, may result in rendering the submitting entity non-responsible for the purpose of contract award.
- A materially false statement willfully or fraudulently made in connection with this certification may subject the person making the false statement to criminal charges

I, David A. Temeles, being duly sworn, state that I have read  
*Enter Your Name*

and understand all the items contained in the vendor questionnaire and any submission of change as identified on page one of this form and certify that as of this date, these items have not changed. I further certify that, to the best of my knowledge, information and belief, those answers are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate.

In addition, I further certify on behalf of the submitting vendor that the information contained in the principal questionnaire(s) and any submission of change identified on page two of this form have not changed and have been verified and continue, to the best of my knowledge, to be full, complete and accurate.

I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

## Vendor Questionnaire *This section is required.*

*This refers to the vendor questionnaire(s) submitted for the vendor doing business with the City.*

Name of Submitting Entity: Prismatic Development Corporation

Vendor's Address: 60 US Highway 46, Fairfield, NJ 07004

Vendor's EIN or TIN: 22-2433095 Requesting Agency: \_\_\_\_\_

Are you submitting this Certification as a parent? (Please circle one) Yes ☐ No ☒

Signature date on the last full vendor questionnaire signed by the submitting vendor: 9/20/13

Signature date on changed submission, if applicable, for the submitting vendor: N/A

# Principal Questionnaire

This section refers to the most recent principal questionnaire submissions.



	Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on Changed Submission (if applicable)
1	Robert V. Gamba	9/20/13	N/A
2	David A. Temeles	9/20/13	N/A
3	Carol Gamba	10/10/13	N/A
4			
5			
6			

☐ Check if additional changes were submitted and attach a document with the date of additional submissions.

## Certification *This section is required.*

*This form must be signed and notarized. Please complete this twice. Copies will not be accepted.*

### Certified By:

David A. Temeles  
Name (Print)

Executive Vice President  
Title

Prismatic Development Corporation  
Name of Submitting Entity

Signature  Date 10/28/13

### Notarized By:

Karen A. Meyer  
Notary Public

County License Issued

License Number

KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

Sworn to before me on: 10/28/13  
Date



THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

November 2, 2012

**ADDENDUM No. # 4**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for November 15, 2012, at 2:00 pm is rescheduled to November 20, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to Addendum #2:**

See Attachment B.

4. **Revisions to Specifications:**

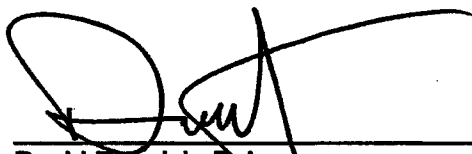
See Attachment C.

5. **Revisions to Drawings:**

See Attachment D.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
\_\_\_\_\_  
David Resnick, R.A.  
Deputy Commissioner

Prismatic Development Corporation

Name of Bidder

By: 

Robert V. Gamba  
President/C.E.O.

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

October 18, 2012

**ADDENDUM No. # 3**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for October 25, 2012, at 2:00 pm is rescheduled to November 15, 2012, at 2:00 pm.**

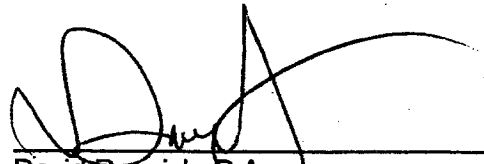
Contract #1 – General Construction Work

Please note that all Questions must be submitted in writing no later than October 24, 2012

2. **Bidders Questions and Responses to Questions:**  
See Attachment A.
3. **Revisions to Addendum #2:**  
See Attachment B.
4. **Revisions to Addendum to the General Conditions:**  
See Attachment C.
5. **Revisions to Specifications:**  
See Attachment D.
6. **Revisions to Drawings:**  
See Attachment E.
7. **Revisions to the Bid Booklet:**  
See Attachment F.

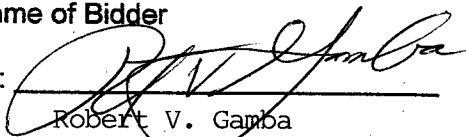
THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
David Resnick, R.A.  
Deputy Commissioner

Prismatic Development Corporation  
Name of Bidder

By:

  
Robert V. Gamba  
President/C.E.O.

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

September 26, 2012

**ADDENDUM No. # 2**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

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This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

---

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for October 11, 2012, at 2:00 pm is rescheduled to October 25, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to the Addendum to the General Conditions:**

See Attachment B

4. **Revisions to Specifications:**

See Attachment C.

5. **Revisions to Drawings:**

See Attachment D.

6. **Revisions to the Bid Booklet:**

See Attachment E.

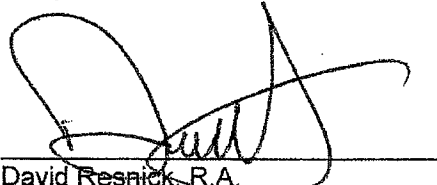
7. **Revisions to Volume 2:**

See Attachment F.

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THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
\_\_\_\_\_  
David Resnick, R.A.  
Deputy Commissioner

Prismatic Development Corporation  
Name of Bidder

By: 

Robert V. Gamba  
President/C.E.O.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT A – BIDDERS QUESTIONS AND DDC RESPONSES**

No.	Bidders' Questions	DDC Responses
1	Can you please advise if the fenced in parking area east of the building site which currently houses impounded vehicles will be available to the General Contractor for a site staging area?	The fenced in parking area east of the building will not be available for site storage and staging. Revised Drawing C013 provided in Addendum #2 shows the space available for site storage and staging. See Attachment D, Revisions to Drawings.
2	Will the area of land along the existing marina south retaining wall be accessible for construction equipment (crane, excavator, loader) and material deliveries (armor stone)?	The marina's retaining wall is adjacent to the DSNY property line. There is no strip of land on the DSNY side of the property line – this area is under water.
3	What is the depth (tip elevation) of the existing fender piles on the North bulkhead?	Available design drawings for the existing fendering indicate the pile tips to be at Elevation -45'. The as-built condition may differ.
4	Do the new PSP900 King piles have to be coated on the interior, meaning can be coated after assembled as doubles? Or do they have to be coated as singles so all surfaces of the pile are covered?	The interior king pile cavity need not be coated. Each double king pile should be coated externally as a unit after fabrication. An addendum will specify casting a 2 foot deep concrete plug on top of each double king pile cavity after driving, cut-off and coating touch-up, to seal the cavity.
5	On Drawing S-803.00, how is the contractor expected to install the concrete encasement around the 18 inch diameter RCP in between the bulkhead and cofferdam space of 2'-8" which is partially below mean low water?	Addendum #2 shows demolition of the existing corner segment of concrete walkway. See Attachment D, Revisions to Drawings. This will allow access for excavation of fill between the PZ bulkhead and cofferdam cells before positioning the RCP outfall. As shown in Section 3 on drawing S-803.00, the space between the cofferdam and bulkhead is much wider than 2'-8" on the east side, due to the curvature of the cofferdam's corner cell. Concrete can be placed underwater in conformance with paragraph 3.05.G of Section 03300, cast on screeded excavated subgrade with side forms. Backfill would then be placed to refill between the cell and the bulkhead, and the corner segment of walkway would then be rebuilt to match existing.
6	What are the dimensions and thickness of the steel plate in Section 1/S-904?	The steel plate shown in the referenced section is the flange of the HP12 fender pile.
7	What diameter and wall thickness is the "3X strong" pipe on Detail 2/S-903?	The intended call out is for a 3 inch diameter extra strong (meaning Schedule 80) pipe.
8	What thickness are the corner gussets on Detail 2/S-903?	As indicated in Detail 2, gussets are typically 3/8" thick.

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

September 12, 2012

**ADDENDUM No. # 1**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

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This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

---

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for September 27, 2012, at 2:00 pm is rescheduled to October 11, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to the Bid Booklet:**

See Attachment B.

4. **Revisions to Specifications:**

See Attachment C.

5. **Revisions to Drawings:**

See Attachment D.

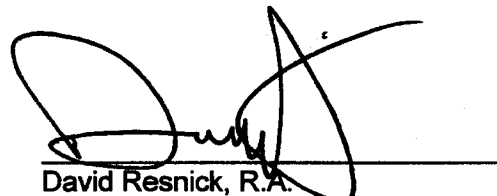
6. **Revisions to the Addendum to the General Conditions:**

See Attachment E.

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THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

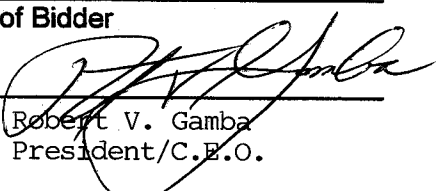
If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.



David Resnick, R.A.  
Deputy Commissioner

Prismatic Development Corporation  
Name of Bidder

By: \_\_\_\_\_



Robert V. Gamba  
President/C.E.O.



**Project Labor Agreement - - Letter of Assent**

Dear: City of NY, Department of Design & Construction, Div. of Public Buildings

The undersigned party confirms that it agrees to be a party to and be bound by the New York Agency, Project Labor Agreement as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Project Labor Agreement, its Schedules, Addenda and Exhibits are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor (hereinafter Contractor) on the Project known as Marine Transfer and located at Brooklyn, NY (hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECT, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

- (1) Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all schedules; amendments and supplements now existing or which are later made thereto;
- (2) Agrees to be bound by the legally established collective bargaining agreements and local trust agreements as set forth in the Project Labor Agreement and this Agreement but only to the extent of Program Work and as required by the PLA.
- (3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor but only to the extent of Program Work as required by the PLA.
- (4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of said Agreement. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier subcontractor it has engaged or may engage to work on the Project. Labor harmony disputes/issues shall be subject to the Labor Management Committee provisions.
- (5) Agrees to secure from any Contractor(s) (as defined in said Agreement) which is or becomes a Subcontractor (of any tier), to it, a duly executed Agreement to be Bound in from identical to this document.

Dated: 2/28/13

Prismatic Development Corporation

(Name of Contractor or subcontractor)

URS/LiRo

(Name of CM; GC; Contractor or  
Higher Level Subcontractor)

(Authorized Officer & Title) Robert V. Gamba  
President/C.E.O.

60 US Highway 46, Fairfield, NJ 07004

(Address)

(973) 882-1133 / (973) 882-1132

(Phone) (Fax)

Contractor's State License

# \_\_\_\_\_

Sworn to before me this  
28th day of February, 2009 13

Karena Meyer

Execution Version

44

KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014





## **NOTICE TO BIDDERS:**

- **PROJECT LABOR AGREEMENT:** This contract is subject to a Project Labor Agreement ("PLA") entered into between the City and the Building and Construction Trades Council of Greater New York ("BCTC") affiliated Local Unions. By submitting a bid, the Contractor agrees that the PLA is binding on the Contractor and all subcontractors of all tiers. The bidder to be awarded the contract will be required to execute a "Letter of Assent" prior to award.

The Bidder is advised to review the following: (1) Notice regarding the PLA, (2) the PLA, and (3) the Letter of Assent, all of which are set forth at the beginning of Volume 2 of the Contract Documents.

- **SINGLE CONTRACT:** As stated above, this contract is subject to a PLA. The requirements of the Wicks Law for separate prime contractors DO NOT APPLY to any project that is covered by a PLA. Accordingly, the requirements of the Wicks Law for separate prime contractors do not apply to this Project. The Project consists of a single contract, the Contract for General Construction Work.

The Bidder is advised to review the Notice set forth at the beginning of Volume 2 of the Contract Documents. The Notice specifies revisions to the Contract Documents to provide that the Project consists of a single contract and to delete any and all references to separate prime contractors.

## **SPECIAL NOTICE TO BIDDERS**

**The New York City Department of Small Business Services (SBS), in conjunction with the New York Business Development Corporation (NYBDC), have established a NYC Construction Loan pilot program to provide prime contractors and subcontractors financing for mobilization costs on certain City construction projects.**

**Under this initiative, loans are available for early stage mobilization needs such as insurance, labor, supplies and equipment. Bidders are strongly encouraged to visit "Growing Your Business" at [www.nyc.gov/nycbusiness](http://www.nyc.gov/nycbusiness) to learn more about the loan or contact [constructionloan@sbs.nyc.gov](mailto:constructionloan@sbs.nyc.gov) / (212) 513-6444 to obtain details and to determine preliminary eligibility.**

**A successful loan applicant will be required to make an assignment of its contract (or subcontract) payments to the lender NYBDC until the loan is repaid. If the loan is to a subcontractor, a prime contractor must honor the terms of such an assignment.**

**A prime contractor may not discriminate against a subcontractor or potential subcontractor by reason of the subcontractor's participation, or nonparticipation, in the NYC Construction Loan program.**

**BID BOOKLET  
PART A**

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**PROJECT ID: S216-399A**

**CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES**

**BID BOOKLET**

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**CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES**

**SPECIAL NOTICE TO BIDDERS**

**BID SUBMISSION REQUIREMENTS**

**THE BID SHALL CONSIST OF TWO (2) SEPARATE, SEALED  
ENVELOPES. THE DOCUMENTS THAT MUST BE COMPLETED AND  
INCLUDED IN EACH SEPARATE ENVELOPE ARE LISTED BELOW.**

**BID ENVELOPE #1:** Bid Envelope #1 shall contain the following items:

- Bid Form, including Affirmation
- Bid Security (if required, see page 22)
- MWBE Subcontractor Utilization Plan (if participation goals have been established)

**BID ENVELOPE #2:** Bid Envelope #2 shall contain **ONLY** the following item:

- Bidder's Identification of Subcontractors (see pages 16 & 17)

**FAILURE TO SUBMIT THE FOUR ITEMS LISTED ABOVE  
WILL RESULT IN THE DISQUALIFICATION OF THE BID**

**BID ENVELOPE #1:** In addition to the items listed above, Bid Envelope #1 shall also contain the following items: **DO NOT** Include the items listed below in Bid Envelope #2.

- Bid Breakdown (if required, see page 21)
- Safety Questionnaire
- Construction Employment Report (if bid is \$1,000,000 or more)
- Contract Certificate (if bid is less than \$1,000,000)
- Confirmation of Vendex Compliance
- Bidder's Certification of Compliance with Iran Divestment Act
- Special Experience Requirements Qualification Form (if required, see pages 3, 4)

**FAILURE TO SUBMIT THE SEVEN ITEMS LISTED ABOVE  
MAY RESULT IN THE DISQUALIFICATION OF THE BID.**

- NOTES:**
- (1) All of the above referred to blank forms to be completed and submitted with the bid are included in the BID BOOKLET.
  - (2) If additional information is required, please contact DDC at 718-391-2601.
  - (3) **VENDEX QUESTIONNAIRES:** Vendex Questionnaires, as well as detailed instructions, may be obtained at [www.nyc.gov/vendex](http://www.nyc.gov/vendex). The bidder may also obtain Vendex forms and instructions by contacting the Agency Chief Contracting Officer or the contact person for this contract.
  - (4) **SPECIAL EXPERIENCE REQUIREMENTS:** The Bidder is advised that Special Experience Requirements may apply to this contract. Such requirements are set forth on pages 3 and 4 of this Bid Booklet.
  - (5) **SPECIAL EXPERIENCE REQUIREMENTS FOR ASBESTOS:** The Bidder is advised that this contract contains strict requirements regarding the prior experience and licensing of the subcontractor who will perform any required asbestos abatement work. These special experience requirements are set forth in the section of the specifications which describes any required asbestos abatement work.

## SPECIAL EXPERIENCE REQUIREMENTS

Special Experience Requirements apply as indicated below.

<b>Bidder:</b>	<b>General Construction</b>	<u>  X  </u>	<b>YES</b>	<u>      </u>	<b>NO</b>
<b>Specific Areas of Work:</b>	<b>General Construction</b>	<u>  X  </u>	<b>YES</b>	<u>      </u>	<b>NO</b>
	<b>Plumbing Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>
	<b>HVAC Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>
	<b>Electrical Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>
<b>Manufacturers:</b>	<b>General Construction</b>	<u>  X  </u>	<b>YES</b>	<u>      </u>	<b>NO</b>
	<b>Plumbing Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>
	<b>HVAC Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>
	<b>Electrical Work</b>	<u>      </u>	<b>YES</b>	<u>  X  </u>	<b>NO</b>

(A) **EXPERIENCE REQUIREMENTS FOR THE BIDDER:** The special experience requirements set forth below apply to the bidder for the General Construction Contract. Compliance with such special experience requirements will be determined solely by the City prior to an award of contract. Failure to comply with the special experience requirements will result in the rejection of the bid as non-responsive.

(1) The bidder must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work.

(B) **QUALIFICATION FORM:** For each project submitted to demonstrate compliance with the special experience requirements, the bidder must complete the Qualification Form included in the Bid Booklet. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

(C) **CONDITIONS:** The City may, in determining compliance with the special experience requirements set forth above, consider prior projects completed by principal(s) or other employees of the bidder while affiliated with another entity, subject to the conditions set forth below.

(1) Any principal or other employee on whose prior experience the bidder is relying to demonstrate compliance with these special experience requirements must have held the following: (a) a significant management role in the prior entity with which he/she was affiliated, and (b) a significant management role in the entity submitting the bid for a period of six months or from the inception of the bidding entity. If the bidder is relying on the prior experience of a principal or employee, it must submit documentation confirming the position held by such principal or employee in the prior entity, as well as in the bidding entity.

(2) The bidder may not rely on the experience of its principals or other employees to demonstrate compliance with any other requirements, including without limitation, financial requirements or requirements for a specified minimum amount of annual gross revenues.

(D) **EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK:** The special experience requirements set forth below apply to the contractor or subcontractor who will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor who will perform these specific areas of work. If the bidder intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the bidder intends to subcontract these specific areas of work, the proposed subcontractor(s) must

demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City. The bidder is advised to carefully review these special experience requirements prior to submitting its bid, as such experience requirements will be strictly enforced.

(1) Special experience requirements apply to the specific areas of work set forth below.

(a) Section 07610: Sheet Metal Roofing

(2) Special experience requirements applicable to the contractor or subcontractor that will perform specific areas of work are summarized below. Such experience requirements are set forth in full in the Addendum to the General Conditions.

(a) The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition, the contractor or subcontractor must be licensed, certified or approved by the manufacturer.

(3) For each project submitted to demonstrate compliance with the special experience requirements for specific areas of work, the contractor or proposed subcontractor will be required to complete the Qualification Form included in the Bid Booklet. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

(E) **EXPERIENCE REQUIREMENTS FOR MANUFACTURER(S)**: The special experience requirements set forth below apply to the manufacturer who will supply or fabricate specific material or equipment. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of award, the contractor will be required to submit the qualifications of the proposed manufacturer(s). Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.

(1) Special experience requirements apply to the manufacturer(s) set forth below.

(a) Section 07610: Sheet Metal Roofing

(2) Special experience requirements applicable to the manufacturer(s) of specified material or equipment are summarized below. Such experience requirements are set forth in full in the Addendum to the General Conditions.

(a) The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.



## Qualification Form

Project ID: S216-399A

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: \_\_\_\_\_

Name of Project: \_\_\_\_\_

Location of Project: \_\_\_\_\_

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: \_\_\_\_\_

Title: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Brief description of work completed: \_\_\_\_\_

Was the work performed as a prime or a subcontractor: \_\_\_\_\_

Amount of Contract: \_\_\_\_\_

Date of Completion: \_\_\_\_\_

\*\*\*\*\*

Name of Contractor: \_\_\_\_\_

Name of Project: \_\_\_\_\_

Location of Project: \_\_\_\_\_

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: \_\_\_\_\_

Title: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Brief description of work completed: \_\_\_\_\_

Was the work performed as a prime or a subcontractor: \_\_\_\_\_

Amount of Contract: \_\_\_\_\_

Date of Completion: \_\_\_\_\_

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## MWBE PROGRAM

### SUBCONTRACTOR UTILIZATION PLAN

**Schedule B: Subcontractor Utilization Plan:** Schedule B: Subcontractor Utilization Plan for this Contract is set forth on the following pages of this Bid Booklet. Schedule B: Subcontractor Utilization Plan (Part I) indicates whether participation goals have been established for this Contract. If participation goals have been established for this Contract, the bidder must submit Schedule B: Subcontractor Utilization Plan (Part II) with its bid.

**Contract Provisions:** Contract provisions regarding the participation of the MWBE firms are set forth in Article 77 of the Contract. The bidder is advised to review these contract provisions.

**Waiver:** The bidder may seek a full or partial pre-award waiver of the Target Subcontracting Percentage in accordance with Article 77 of the Contract (See Part A, Section 10). The bidder's request for a waiver must be submitted at least seven (7) calendar days prior to the bid date. Waiver requests submitted after the deadline will not be considered. The form for requesting a waiver of the Target Subcontracting Percentage is set forth in Schedule B: Subcontractor Utilization Plan (Part III).

**Rejection of the Bid:** The bidder must complete Schedule B: Subcontractor Utilization Plan (Part II) set forth on the following pages. Subcontractor Utilization Plans which do not include the required affirmations (on Page 2) will be deemed to be non-responsive, unless a full waiver of the Target Subcontracting Percentage is granted (Schedule B: Subcontractor Utilization Plan, Part III). In the event that the City determines that the bidder has submitted a Schedule B: Subcontractor Utilization Plan where the required affirmations are completed but other aspects of the Plan are not complete, or contain a copy or computation error that is at odds with the affirmation, the bidder will be notified by the Agency and will be given four (4) calendar days from receipt of notification to cure the specified deficiencies and return a completed plan to the Agency. Failure to do so will result in a determination that the Bid is non-responsive.

Receipt of notification is defined as the date notice is emailed or faxed (if the bidder has provided an email address or fax number), or no later than five (5) days from the date of mailing or upon delivery, if delivered.

**Impact on LBE Requirements:** If goals have been established for the participation of M/WBE's, the contractor is not required to comply with the Locally Based Enterprise Program ("LBE"). The LBE Program is set forth in Article 67 of the Contract.

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Tax ID #: \_\_\_\_\_

PIN#: 8502013TR0001C

Contract # 1 - General Construction Work

The City of New York

**SCHEDULE B - Subcontractor Utilization Plan -Part I: Agency's Target**

This page to be completed by contracting agency

**Contract Overview**

**Pin #** 8502013TR0001C **FMS Project ID#:** S216-399A  
**Project Title** Southwest Brooklyn Marine Transfer Station - Building Construction  
**Contracting Agency** Department of Design and Construction  
**Agency Address** 30-30 Thomson Avenue **City** Long Island City **State** NY **Zip Code** 11101  
**Contact Person** James A. Cerasoli **Title** Deputy Director  
**Telephone #** (718) 391-1549 **Email** cerasoli@ddc.nyc.gov

**Project Description** (attach additional pages if necessary)

This Project consists of the construction of a new marine transfer station. The principal items of work include construction of a new marine transfer station with access ramps, demolition of existing fendering systems, site work, utilities, equipment, dredging, HVAC systems, plumbing systems, fire protection, and electrical systems.

**(1) ✓ Target Subcontracting Percentage**

Percentage of total contract dollar value that agency estimates will be awarded to subcontractors in amounts under \$1 million for construction and professional services.

10 %**Subcontractor Participation Goals**

Complete and enter total for each Construction or Professional Services, or both (if applicable)

Group	Construction	Professional Services
Black American	UNSPECIFIED %	N/A %
Hispanic American	UNSPECIFIED %	N/A %
Asian American	UNSPECIFIED %	No Goal
Caucasian Female	No Goal	N/A %
<b>Total Participation Goals</b>	<b>(2) 50 %</b>	<b>(3) N/A %</b>

Note: For this procurement, individual ethnicity and gender goals are not specified. The Total Participation Goals for construction subcontracts may be met by using Black American, Hispanic American or Asian American firms or any combination of such firms.

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Tax ID #: \_\_\_\_\_

PIN#: \_\_\_\_\_

**SCHEDULE B - Subcontractor Utilization Plan – Part II: Bidder/Proposer Subcontracting Plan**

This page and the next (Part II herein) are to be completed by the bidder/proposer. **AFFIRMATIONS; Bidder/proposer must check the applicable boxes below, affirming compliance with M/WBE requirements.**

Bidder/proposer ☐ AFFIRMS or ☐ DOES NOT AFFIRM [statement below]

It is a material term of the contract to be awarded that, with respect to the total amount of the contract to be awarded, bidder/proposer will award one or more subcontracts for amounts under one million dollars, sufficient to meet or exceed the Target Subcontracting Percentage (as set forth in Part I) unless it obtains a full or partial waiver thereof, and it will award subcontracts sufficient to meet or exceed the Total Participation Goals (as set forth in Part I) unless such goals are modified by the Agency.

Bidder/proposer ☐ AFFIRMS that it intends to meet or exceed the Target Subcontracting Percentage (as set forth in Part 1); or

☐ AFFIRMS that it has obtained a full/partial pre-award waiver of the Target Subcontracting Percentage (as set forth in Part I) and intends to award the modified Target Subcontracting Percentage, if any; or

☐ DOES NOT AFFIRM

**Section I: Prime Contractor Contact Information**

Tax ID # \_\_\_\_\_ FMS Vendor ID # \_\_\_\_\_

Business Name \_\_\_\_\_ Contact Person \_\_\_\_\_

Address \_\_\_\_\_

Telephone # \_\_\_\_\_ Email \_\_\_\_\_

**Section II: General Contract Information****1. Define the industry in which work is to be performed.**

- **Construction** includes all contracts for the construction, rehabilitation, and/or renovation of physical structures. This category does include CM Build as well as other construction related services such as: demolition, asbestos and lead abatement, and painting services, carpentry services, carpet installation and removal, where related to new construction and not maintenance.
- **Professional Services** are a class of services that typically require the provider to have some specialized field or advanced degree. Services of this type include: legal, management consulting, information technology, accounting, auditing, actuarial, advertising, health services, pure construction management, environmental analysis, scientific testing, architecture and engineering, and traffic studies, and similar services.

**a. Type of work on Prime Contract (Check one):****b. Type of work on Subcontract (Check all that apply):**

☐ Construction ☐ Professional Services ☐ Construction ☐ Professional Services ☐ Other

**2. What is the expected percentage of the total contract dollar value that you expect to award to all subcontracts?**

\_\_\_\_\_ %

**3. Will you award subcontract(s) in amounts below \$ 1 million for construction and/or professional services contracts within the first 12 months of the notice to proceed on the contract?**

☐ Yes ☐ No

**Section III: Subcontractor Utilization Summary**

**IMPORTANT: If you do not anticipate that you will subcontract at the target level the agency has specified, because you will perform more of the work yourself, you must seek a waiver of the Target Subcontracting Percentage by completing p. 9).**

Step 1:	Subcontracts under \$1M (4) (construction/professional services)	Total Bid/Proposal Value	Calculated Target Subcontracting Percentage
Calculate the percentage (of your total bid) that will go towards subcontracts under \$1M for construction and/or professional services	<div style="background-color: #cccccc; width: 150px; height: 20px;"></div>	<div style="background-color: #cccccc; width: 150px; height: 20px;"></div>	
	\$	÷ \$	x 100 = %

- **Subcontracts under \$1M (construction/professional services):** Enter the value you expect to award to subcontractors in dollars for amounts under \$1 million for construction and/or professional services. This value defines the amount that participation goals apply to, and will be entered into the first line of Step 2.
- **Total Bid/Proposal Value:** Provide the dollar amount of the bid/proposal.
- **Calculated Target Subcontracting Percentage:** The percentage of the total contract dollar value that will be awarded to one or more subcontractors for amounts under \$1 million for construction and/or professional services. **This percentage must equal or exceed the percentage listed by the agency on page 1, at line (1).**

**NOTE: The "Calculated Target Subcontracting Percentage" MUST equal or exceed the Target Subcontracting Percentage listed by the agency on Page 6, Line (1).**

Tax ID #: \_\_\_\_\_

PIN#: \_\_\_\_\_

**SCHEDULE B - cont.****Step 2:**

Calculate value of subcontractor participation goals

**Subcontracts under \$1M**  
(construction/professional services)

a. Copy value from Step 1, line (4) – the total value of all expected subcontracts under \$1M for construction and/or professional services

\$ \_\_\_\_\_

b. \* From line a. above, allocate the dollar value of "Subcontracts under \$1M" by Construction and Professional Services,

**Construction****Professional Services**

\* If all subcontracts under \$1M are in one industry, enter '0' for the industry with no subcontracts.

\* Amounts listed on these lines should add up to the value from line a.

**Subcontracts under \$1M by Industry** \$ \_\_\_\_\_

\$ \_\_\_\_\_

\* For Construction enter percentage from line (2) from Page 6.

\* For Professional Services enter percentage from line (3) from Page 6.

c. \* **Total Participation Goals Percentages must be copied from Part I, lines (2) and (3).****Total Participation Goals** x \_\_\_\_\_ %

x \_\_\_\_\_ %

d. **Value of Total Participation Goals** \$ \_\_\_\_\_

\$ \_\_\_\_\_

**Step 3:**☒ **Subcontracts in Amounts Under \$1 M Scope of Work – Construction**

Enter brief description of type(s) of subcontracts in amounts under \$1M anticipated, by type of work, not by name of subcontractor

☒ **Subcontracts in Amounts Under \$1 M Scope of Work – Professional Services**

Enter brief description of type(s) of subcontracts in amounts under \$1M anticipated, by type of work, not by name of subcontractor

**Section IV: Vendor Certification and Required Affirmations**

I hereby 1) acknowledge my understanding of the M/WBE requirements as set forth herein and the pertinent provisions of Local Law 129 of 2005, and the rules promulgated thereunder; 2) affirm that the information supplied in support of this subcontractor utilization plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE requirements of this Contract and the pertinent provisions of Local Law 129 of 2005, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this contract; 4) agree and affirm that it is a material term of this contract that the Vendor will award subcontract(s) sufficient to meet the Target Subcontracting Percentage, unless a waiver is obtained, and the Vendor will award subcontract(s) sufficient to meet the Total Participation Goals unless such goals are modified by the Agency; and 5) agree and affirm, if awarded this contract the Vendor intends to make all reasonable, good faith efforts to meet the Target Subcontracting Percentage, or If the Vendor has obtained a waiver, the Vendor intends to meet the modified Target Subcontracting Percentage, if any, and the Vendor intends to solicit and obtain the participation of M/WBEs so as to meet the Total Participation Goals unless modified by the Agency.

Signature \_\_\_\_\_ Date \_\_\_\_\_

Print Name \_\_\_\_\_ Title \_\_\_\_\_



Tax ID #: \_\_\_\_\_

PIN#: \_\_\_\_\_

**SCHEDULE B****PART III - REQUEST FOR WAIVER OF TARGET SUBCONTRACTING PERCENTAGE****Contract Overview**

Tax ID # \_\_\_\_\_ FMS Vendor ID # \_\_\_\_\_

Business Name \_\_\_\_\_

Contact Name \_\_\_\_\_ Telephone # \_\_\_\_\_ Email \_\_\_\_\_

Type of Procurement ☐ Competitive Sealed Bids ☐ Other Bid/Response Due Date \_\_\_\_\_

PIN # (for this procurement) \_\_\_\_\_ Type of work on Prime Contract \_\_\_\_\_ Type of work on Subcontract (Check all that apply):

(Check one):

☐ Construction☐ Construction☐ Other☐ Professional Services☐ Professional Services**SUBCONTRACTING as described in bid/solicitation documents (Copy this % figure from Subcontractor Utilization Plan, Part I, line**

\_\_\_\_\_% of the total contract value anticipated by the agency to be subcontracted for construction/professional services subcontracts valued below \$1 million (each)

**ACTUAL SUBCONTRACTING as anticipated by vendor seeking waiver**

\_\_\_\_\_% of the total contract value anticipated in good faith by the bidder/proposer to be subcontracted for construction/ professional services subcontracts valued below \$1 million (each)

**Basis for Waiver Request: Check appropriate box & explain in detail below (attach additional pages if needed)**☐ Vendor does not subcontract construction/professional services, and has the capacity and good faith intention to perform all such work itself.☐ Vendor subcontracts some of this type of work but at lower % than bid/solicitation describes, and has the capacity and good faith intention to do so on this contract.☐ Other \_\_\_\_\_**References****List 3 most recent contracts/subcontracts performed for NYC agencies (if any)**

CONTRACT NO. \_\_\_\_\_ AGENCY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

CONTRACT NO. \_\_\_\_\_ AGENCY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

CONTRACT NO. \_\_\_\_\_ AGENCY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

**List 3 most recent contracts/subcontracts performed for other agencies/entities**

(complete ONLY if vendor has performed fewer than 3 NYC contracts)

TYPE OF WORK \_\_\_\_\_ AGENCY/ENTITY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

Manager at agency/entity that hired vendor (Name/Phone No.) \_\_\_\_\_

TYPE OF WORK \_\_\_\_\_ AGENCY/ENTITY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

Manager at agency/entity that hired vendor (Name/Phone No.) \_\_\_\_\_

TYPE OF WORK \_\_\_\_\_ AGENCY/ENTITY \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

Manager at agency/entity that hired vendor (Name/Phone No.) \_\_\_\_\_

**VENDOR CERTIFICATION: I hereby affirm that the information supplied in support of this waiver request is true and correct, and that this request is made in good faith.**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**Shaded area below is for agency completion only****AGENCY CHIEF CONTACTING OFFICER APPROVAL**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**CITY CHIEF PROCUREMENT OFFICER APPROVAL**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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**BID FORM**  
**THE CITY OF NEW YORK**  
**DEPARTMENT OF DESIGN AND CONSTRUCTION**  
**DIVISION OF STRUCTURES**

**BID FOR FURNISHING ALL LABOR AND  
MATERIAL NECESSARY AND REQUIRED FOR:**

**PROJECT ID: S216-399A**

**Southwest Brooklyn Marine Transfer Station - Building Construction**  
**1824 Shore Parkway**  
**Brooklyn 11214**

Name of Bidder: \_\_\_\_\_

Date of Bid Opening: \_\_\_\_\_

Bidder is: (Check one, whichever applies)    Individual (    )    Partnership (    )    Corporation (    )

Place of Business of Bidder: \_\_\_\_\_

Bidder's Telephone Number: \_\_\_\_\_ Bidder's Fax Number: \_\_\_\_\_

Bidder's Email Address: \_\_\_\_\_

Residence of Bidder (If Individual): \_\_\_\_\_

If Bidder is a Partnership, fill in the following blanks:

Names of Partners

Residence of Partners

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If Bidder is a Corporation, fill in the following blanks:

Organized under the laws of the State of \_\_\_\_\_

Name and Home Address of President: \_\_\_\_\_  
\_\_\_\_\_

Name and Home Address of Secretary: \_\_\_\_\_  
\_\_\_\_\_

Name and Home Address of Treasurer: \_\_\_\_\_  
\_\_\_\_\_

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## BID FORM

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The above-named Bidder affirms and declares:

1. The said bidder is of lawful age and the only one interested in this bid; and no person, firm or corporation other than hereinbefore named has any interest in this bid, or in the Contract proposed to be taken.
2. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
3. No councilman or other officer or employee or person whose salary is payable in whole or in part from the City Treasury is directly or indirectly interested in this bid, or in the supplies, materials, equipment, work or labor to which it relates, or in any of the profits thereof.
4. The bidder is not in arrears to the City of New York upon debt or contract or taxes, and is not a defaulter, as surety or otherwise, upon any obligation of the City of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York or State of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except as set forth on the Affirmation included as page 17 of this Bid Booklet.

The bidder hereby affirms that it has paid all applicable City income, excise and other taxes for all years it has conducted business activities in New York City.

5. The bidder, as an individual, or as a member, partner, director or officer of the bidder, if the same be a firm, partnership or corporation, executes this document expressly warranting and representing that should this bid be accepted by the City and the Contract awarded to him, he and his subcontractors engaged in the performance:  
(1) will comply with the provisions of Section 6-108 of the Administrative Code of the City of New York and the non-discrimination provisions of Section 220a of the New York State Labor Law, as more expressly and in detail set forth in the Agreement; (2) will comply with Section 6-109 of the Administrative Code of the City of New York in relation to minimum wages and other stipulations as more expressly and in detail set forth in the Agreement; (3) have complied with the provisions of the aforesaid laws since their respective effective dates, and (4) will post notices to be furnished by the City, setting forth the requirements of the aforesaid laws in prominent and conspicuous places in each and every plant, factory, building and structure where employees engaged in the performance of the Contract can readily view it, and will continue to keep such notices posted until the supplies, materials and equipment, or work labor and services required to be furnished or rendered by the Contractor have been finally accepted by the City. In the event of any breach or violation of the foregoing, the Contractor may be subject to damages, liquidated or otherwise, cancellation of the Contract and suspension as a bidder for a period of three years. (The words, "the bidder", "he", "his", and "him" where used shall mean the individual bidder, firm, partnership or corporation executing this bid).

6. Compliance Report

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, (1) represents that his attention has been specifically drawn to Executive Order No. 50, dated April 25, 1980, on Equal Employment Compliance of the contract, and (2) warrants that he will comply with the provisions of Executive Order No. 50. The Employment Report must be submitted as part of the bid.

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, executes this document expressly warranting that he will comply with: (1) the provision of the contract on providing records, Chapter 8.

7. By submission of this bid, the bidder certifies that it now has and will continue to have the financial capability to fully perform the work required for this contract. Any award of this contract will be made in reliance upon such certification. Upon request therefor, the bidder will submit written verification of such financial capability in a form that is acceptable to the department.

8. In accordance with Section 165 of the State Finance Law, the bidder agrees that tropical hardwoods, as defined in Section 165 of the State Finance Law, shall not be utilized in the performance of this Contract, except as the same are permitted by the foregoing provision of law.

9. The bidder has visited and examined the site of the work and has carefully examined the Contract in the form approved by the Corporation Counsel, and will execute the Contract and perform all its items, covenants and conditions, and will provide, furnish and deliver all the work, materials, supplies, tools and appliances for all labor and materials necessary or required for the hereinafter named work, all in strict conformity with the Contract, for the prices set forth in the Bid Schedule:

**BID FORM**

---

**PROJECT ID: S216-399A**

**TOTAL BID PRICE:** In the space provided below, the Bidder shall indicate the total bid price in figures.

- A. **LUMP SUM PRICE** - Total price for all labor and material for all required work. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For  
Labor

Total Price for Material  
Sold and Delivered

\$ \_\_\_\_\_ + \$ \_\_\_\_\_ Total Price for all work \$ \_\_\_\_\_

**BIDDER'S SIGNATURE AND AFFIDAVIT**

**WARNING!!** Failure to comply with items below will result in the rejection of your bid.

- \* **SUBCONTRACTORS:** You **MUST** complete and submit the form entitled "Bidder's Identification of Subcontractors" (See Page 17) at the time you submit your bid. You must submit this form in a separate, sealed envelope (**BID ENVELOPE #2**). In the event an award of contract is not made to the Bidder, the Bidder hereby authorizes the Agency to shred the form entitled "Bidder's Identification of Subcontractors". \_\_\_\_\_ Yes  
\_\_\_\_\_ No

- \* **MWBE GOALS:** You **MUST** complete and submit the Affirmations contained in the Subcontractor Utilization Plan (See Page 7), or a pre-approved waiver (See Page 9), at the time you submit your bid. You must submit the Affirmations (or a pre-approved waiver) in **BID ENVELOPE #1**.

Bidder: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of Partner or corporate officer)

Attest: \_\_\_\_\_ Secretary of Corporate Bidder  
(Corporate Seal)

Affidavit on the following page should be subscribed  
and sworn to before a Notary Public

**THIS PAGE INTENTIONALLY LEFT BLANK**



**BID FORM (TO BE NOTARIZED)**

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS AN INDIVIDUAL**

STATE OF NEW YORK, COUNTY OF \_\_\_\_\_ ss:

\_\_\_\_\_ being duly sworn says:

I am the person described in and who executed the foregoing bid, and the several matters therein stated are in all respects true.

\_\_\_\_\_  
(Signature of the person who signed the Bid)

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Notary Public

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS A PARTNERSHIP**

STATE OF NEW YORK, COUNTY OF \_\_\_\_\_ ss:

\_\_\_\_\_ being duly sworn says:

I am a member of \_\_\_\_\_ the firm described in and which executed the foregoing bid.  
subscribed the name of the firm thereto on behalf of the firm, and the several matters therein stated are in all respects true.

\_\_\_\_\_  
(Signature of Partner who signed the Bid)

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Notary Public

\*\*\*\*\*

**AFFIDAVIT WHERE BIDDERS IS A CORPORATION**

STATE OF NEW YORK, COUNTY OF \_\_\_\_\_ ss:

\_\_\_\_\_ being duly sworn says:

I am the \_\_\_\_\_ of the above named corporation whose name is subscribed to and which executed  
the foregoing bid. I reside at \_\_\_\_\_.  
I have knowledge of the several matters therein stated, and they are in all respects true.

\_\_\_\_\_  
(Signature of Corporate Officer who signed the Bid)

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Notary Public

## AFFIRMATION

The undersigned bidder affirms and declares that said bidder is not in arrears to the City of New York upon debt, contract or taxes and is not a defaulter, as surety or otherwise, upon obligation to the City of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except \_\_\_\_\_

(If none, the bidder shall insert the word "None" in the space provided above.)

Full Name of Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

CHECK ONE BOX AND INCLUDE APPROPRIATE NUMBER:

☐

A - Individual or Sole Proprietorship \*  
SOCIAL SECURITY NUMBER

-----

☐

B - Partnership, Joint Venture or other unincorporated organization  
EMPLOYER IDENTIFICATION NUMBER

-----

☐

C - Corporation  
EMPLOYER IDENTIFICATION NUMBER

-----

By: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

If a corporation, place seal here

This affirmation must be signed by an officer or duly authorized representative.

\* Under the Federal Privacy Act the furnishing of Social Security Numbers by bidders on City contracts is voluntary. Failure to provide a Social Security Number will not result in a bidder's disqualification. Social Security Numbers will be used to identify bidders, proposers or vendors to ensure their compliance with laws, to assist the City in enforcement of laws, as well as to provide the City a means of identifying of businesses which seek City contracts.

## **BIDDER'S IDENTIFICATION OF SUBCONTRACTORS**

### **NOTICE TO BIDDERS**

**SUBMISSION:** The Bidder must, at the time of the bid, submit the form on the next page ("BIDDER'S IDENTIFICATION OF SUBCONTRACTORS"). This form must be submitted in a separate, sealed envelope (BID ENVELOPE #2). Failure to do so will result in the disqualification of the bid as non-responsive.

\*\*\*\*\*

Please be advised that pursuant to GML § 101(5) the Bidder is required to submit with its bid the names of subcontractors it intends to use to perform the following work on this contract, as well as the agreed-upon amount to be paid to each:

- plumbing and gas fitting;
- steam heating, hot water heating, ventilating and air conditioning apparatus; and
- electric wiring and standard illuminating fixtures.

**NOTE:** This project may not involve all of the above listed subcontractors. Please see the form on the next page which indicates the subcontractors required for this Project.

The list of subcontractors is to be submitted in a separate sealed envelope by completing the form on the next page entitled "Bidder's Identification of Subcontractors". This form provides for the identification of any subcontractors intended to be used in any of the three trades listed above. If bidder intends to use its own forces for any of the above listed work, bidder should so indicate on the form.

Failure to submit the completed form on the next page ("Bidder's Identification of Subcontractors") that includes the names of subcontractors and the agreed upon amounts to be paid to such subcontractors will render the bid non-responsive.

**PLEASE NOTE:** for any contract that is subject to M/WBE participation goals under Local Law 129, if the bidder's intention to use its own forces to do any of the above-referenced work would result in Bidder's failure to attain the Target Subcontracting Percentage identified in the Subcontractor Utilization Plan, the bid will be non-responsive unless the bidder requests and obtains a Waiver of Target Subcontracting Percentage (Subcontractor Utilization Plan, Part III) in advance of bid submission.

After the low bid is announced, the sealed list submitted by the low bidder will be opened and the names of the subcontractors will be announced. The sealed lists of subcontractors submitted by all other bidders shall be maintained by the Agency unopened unless such bidder shall become the low bidder (e.g., the initial low bidder is found non-responsive). All unopened lists of subcontractors shall be returned to the bidders unopened after contract award, unless the bidder has given the agency permission to

After bid submission, any change of subcontractor or agreed-upon amount to be paid to each shall require approval of the Agency upon a showing of a legitimate construction need which shall include, but not be limited to, a change in project specifications, a change in project material costs, a change to subcontractor status as determined pursuant to §222 (2)(e) of the Labor Law, or if the subcontractor has become otherwise unwilling, unable or unavailable to perform the subcontract.

## **BIDDER'S IDENTIFICATION OF SUBCONTRACTORS**

**Project ID: S216-399A**

**SUBMISSION:** In addition to its Bid (Bid Envelope # 1), the Bidder must, at the time of the bid, complete and submit this form in a separate, sealed envelope (Bid Envelope # 2). To complete this form, the Bidder must identify the subcontractors it intends to use for the work listed below, as well as the dollar amount to be paid to each subcontractor. Failure to complete this form and submit it in a separate, sealed envelope will result in the disqualification of the bid as non-responsive.

The Bidder intends to use the following subcontractors. If the Bidder intends to do any of the work referenced below with its own forces, the Bidder should complete this form using its own name. If multiple subcontractors for any trade are proposed, Bidder may submit multiple copies of this form.

**1. PLUMBING CONTRACTOR:**

\_\_\_\_\_  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ \_\_\_\_\_

**2. HVAC CONTRACTOR:**

\_\_\_\_\_  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ \_\_\_\_\_

**3. ELECTRICAL CONTRACTOR:**

\_\_\_\_\_  
(Print Name)

Agreed Amount To Be Paid To Subcontractor: \$ \_\_\_\_\_

**BIDDER'S SIGNATURE:** The Bidder must sign this form in the space provided below:

Name of Bidder: \_\_\_\_\_

By: \_\_\_\_\_

Signature of Partner or Corporate Officer

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

BID BOND 1  
FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS. That we, \_\_\_\_\_

hereinafter referred to as the "Principal", and \_\_\_\_\_

hereinafter referred to as the "Surety" are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "CITY", or to its successors and assigns in the penal sum of \_\_\_\_\_

(\$ \_\_\_\_\_), Dollars lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the Principal is about to submit (or has submitted) to the City the accompanying proposal, hereby made a part hereof, to enter into a contract in writing for \_\_\_\_\_

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall not withdraw said Proposal without the consent of the City for a period of forty-five (45) days after the opening of bids and in the event of acceptance of the Principal's Proposal by the City, if the Principal shall:

- (a) Within ten (10) days after notification by the City, execute in quadruplicate and deliver to the City all the executed counterparts of the Contract in the form set forth in the Contract Documents, in accordance with the proposal as accepted, and
- (b) Furnish a performance bond and separate payment bond, as may be required by the City, for the faithful performance and proper fulfillment of such Contract, which bonds shall be satisfactory in all respects to the City and shall be executed by good and sufficient sureties, and
- (c) In all respects perform the agreement created by the acceptance of said Proposal as provided in the Information for Bidders, bound herewith and made a part hereof, or if the City shall reject the aforesaid Proposal, then this obligation shall be null and void; otherwise to remain in full force and effect.

## BID BOND 2

In the event that the Proposal of the Principal shall be accepted and the Contract be awarded to him the Surety hereunder agrees subject only to the payment by the Principal of the premium therefore, if requested by the City, to write the aforementioned performance and payment bonds in the form set forth in the Contract Documents.

It is expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

There shall be no liability under this bond if, in the event of the acceptance of the Principal's Proposal by the City, either a performance bond or payment bond, or both, shall not be required by the City on or before the 30th day after the date on which the City signs the Contract.

The surety, for the value received, hereby stipulates and agrees that the obligations of the Surety and its bond shall in no way be impaired or affected by any postponements of the date upon which the City will receive or open bids, or by any extensions of time within which the City may accept the Principal's Proposal, or by any waiver by the City of any of the requirements of the Information for Bidders, and the Surety hereby waives notice of any such postponements, extensions, or waivers.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Seal)

\_\_\_\_\_  
Principal

(L.S.)

By: \_\_\_\_\_

(Seal)

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

BID BOND 3

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:  
On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, before me personally came  
\_\_\_\_\_ to me known, who, being by me duly sworn, did depose and say that he  
resides at \_\_\_\_\_  
that he is the \_\_\_\_\_ of \_\_\_\_\_  
the corporation described in and which executed the foregoing instrument; that he knows the seal of said  
corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the  
directors of said corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:  
On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, before me personally appeared  
\_\_\_\_\_ to me known and known to me to be one of the members of the firm of  
\_\_\_\_\_ described in and who executed the foregoing instrument, and he  
acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:  
On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, before me personally appeared  
\_\_\_\_\_ to me known and known to me to be the person described in and who  
executed the foregoing instrument and acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public

AFFIX ACKNOWLEDGEMENTS AND JUSTIFICATION OF SURETIES

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## BID SCHEDULE

**Submission:** Bidders are advised that the requirement to submit a Bid Schedule applies to each contract for which an "X" is indicated before the word "Yes". If required, the bidder must submit, with its bid, a completed Bid Schedule. Failure to provide a completed Bid Schedule may result in rejection of the bid as non-responsive.

      X            YES                                           NO

### Limitations on Use of Bid Schedule:

Bidders are advised that the Bid Schedule shall be used for bid analysis purposes only and shall not be binding for any other purposes under the Contract, including, without limitation, for payment purposes or in connection with a contractor claim for extra work. If the form for the Bid Schedule does not include an item of work required by the Contract Documents, such omission shall have no effect whatsoever, nor shall it be used by the contractor in connection with a claim for extra work (i.e., work for which the contractor is entitled to a change order).

### Instructions for Preparing Bid Schedule:

- (A) The following bid prices on the Bid Schedule are to be paid for the actual quantities of the item numbers in the completed work or structure, and they cover the cost of all work, labor, material, tools, plant and appliances of every description necessary to complete the entire work, as specified, and the removal of all debris, temporary work and appliances.
- (B) In preparing its Bid Schedule, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, bonds, and provision of services or items required by the General Conditions [except for Security/Fire Guard Services and Temporary Heat]. If the Project requires Security/Fire Guard Services and/or Temporary Heat, such service(s) will be included as separate line items in the Bid Schedule.
- (C) The Agency may reject a bid if it contains unbalanced bid prices. An unbalanced bid is considered to be one containing lump sum or unit items which do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs, anticipated for the performance of the items in question.
- (D) If an item is not set forth in the Bid Schedule, but is included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to add the item to its Bid Schedule and include the cost of the item in its grand total. In an attachment to its Bid Schedule, the bidder shall provide a list of all items added.

**PLEASE BE SURE A LEGIBLE BID IS ENTERED FOR EACH ITEM.**  
**THE BIDDER SHALL INSERT THE TOTAL BID PRICE ON**  
**THE BID SCHEDULE ON PAGE 13 OF THIS BID BOOKLET**

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Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

**CONTRACTOR'S BID SCHEDULE**

PROJECT ID: S216-399A

Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
1	Structures and Equipment – <i>items a through l</i>				
a.	General Conditions – <i>see DDC General Conditions and the Addendum to the General Conditions</i>	--	Lump Sum	Not Applicable	\$ _____
	Temporary Heat	--	Lump Sum	Not Applicable	\$ _____
	Security Guards/Fire Guards on Site	--	Lump Sum	Not Applicable	\$ _____
	Trailer Office (monthly utility and service costs included)	36	Month(s)	Not Applicable	\$ _____
b.	Demolition	--	Lump Sum	Not Applicable	\$ _____
c.	Concrete	--	Lump Sum	Not Applicable	\$ _____
d.	Masonry	--	Lump Sum	Not Applicable	\$ _____
e.	Metals	--	Lump Sum	Not Applicable	\$ _____
f.	Woods and Plastics	--	Lump Sum	Not Applicable	\$ _____
g.	Thermal and Moisture Protection	--	Lump Sum	Not Applicable	\$ _____
h.	Doors and Windows	--	Lump Sum	Not Applicable	\$ _____
i.	Finishes	--	Lump Sum	Not Applicable	\$ _____
j.	Specialties	--	Lump Sum	Not Applicable	\$ _____
k.	Furnishings	--	Lump Sum	Not Applicable	\$ _____
l.	Equipment	--	Lump Sum	Not Applicable	\$ _____
2	Concrete Ramp – Option 1 OR Mechanically Stabilized Earth Ramp – Option 2	<u>      </u> <i>check selection</i> <u>      </u>	Lump Sum	Not Applicable	\$ _____

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Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

**CONTRACTOR'S BID SCHEDULE**

PROJECT ID: S216-399A

Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
3	Site Work and Landscaping	--	Lump Sum	Not Applicable	\$ _____
4	Gantry Cranes and Container Transport System	--	Lump Sum	Not Applicable	\$ _____
5	3-Year Service Agreement for Container Gantry Cranes	--	Lump Sum	Not Applicable	\$ _____
6	Heating, Ventilation and Air Conditioning	--	Lump Sum	Not Applicable	\$ _____
7	Plumbing and Fire Protection	--	Lump Sum	Not Applicable	\$ _____
8	Electrical Work	--	Lump Sum	Not Applicable	\$ _____
9	NOT USED	--	--	--	--
10	NOT USED	--	--	--	--
11	Hazardous Material Remediation	--	Allowance	Not Applicable	\$75,000
12	Con Edison Electrical Service Work	--	Allowance	Not Applicable	\$150,000
13	Dredging	5,500	CY	\$ _____ per CY	\$ _____
14	Steel Pipe Piles, 16-inch dia.	3,100	LF	\$ _____ per LF	\$ _____
15	Steel Pipe Piles, 20-inch dia. ---OR--- 150-Ton Composite Tapered Piles	103,400 --or-- 669	LF --or-- EA	\$ _____ per LF --or-- \$ _____ each	\$ _____
16	Steel Pipe Piles, 36-inch dia.: For Concrete Ramp – Option 1 ---OR--- For Mechanically Stabilized Earth Ramp – Option 2 <i>Option selection must match ramp option selected in Bid Item 2</i>	5,800 --or-- 4,000	LF	\$ _____ per LF --or-- \$ _____ per LF	\$ _____
17	Pile Driving Analyzer Load Tests - Steel Pipe Piles	50	EA	\$ _____ each	\$ _____

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Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

**CONTRACTOR'S BID SCHEDULE**

PROJECT ID: S216-399A

Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
18	Compression Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$ _____ each	\$ _____
19	Compression Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$ _____ each	\$ _____
20	Lateral Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$ _____ each	\$ _____
21	Lateral Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$ _____ each	\$ _____
22	Marine Timber Piles	850	LF	\$ _____ per LF	\$ _____
23	Concrete Spall Repair - Shallow	100	SF	\$ _____ per SF	\$ _____
24	Concrete Spall Repair - Deep	100	CF	\$ _____ per CF	\$ _____
25	Concrete Crack Repair - Type A	500	LF	\$ _____ per LF	\$ _____
26	Concrete Crack Repair - Type B	200	LF	\$ _____ per LF	\$ _____
27	Concrete Crack Repair - Type C	100	LF	\$ _____ per LF	\$ _____
28	Additional Earth Excavation	500	CY	\$ _____ per CY	\$ _____
29	Additional Select Fill	100	CY	\$ _____ per CY	\$ _____
30	Additional Common Fill	100	CY	\$ _____ per CY	\$ _____
				<b>TOTAL BID ITEMS 1 through 31</b>	\$ _____

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**PLA PROJECT****ATTACHMENT 1 - BID INFORMATION****PROJECT ID: S216-399A****DESCRIPTION AND LOCATION OF WORK:****Southwest Brooklyn Marine Transfer Station – Building Construction****1824 Shore Parkway****Brooklyn, NY 11214****E-PIN: 85013B0001 / DDC PIN: 8502013TR0001C****DOCUMENTS AVAILABLE AT:**

Department of Design and Construction, Contract Section  
30-30 Thomson Avenue - First Floor, Long Island City, NY 11101

**SUBMISSION OF BIDS BEFORE BID OPENING:****TIME TO SUBMIT:****On or Before: THURSDAY, SEPTEMBER 27, 2012****BIDS MUST BE CLOCKED IN PRIOR TO BID OPENING****PLACE TO SUBMIT:**

Department of Design and Construction, Contract Section (located behind Security Desk)  
30-30 Thomson Avenue - First Floor, Long Island City, NY 11101

**BID OPENING:**

<b>PLACE OF BID OPENING:</b>	<b>Department of Design and Construction Contract Section 30-30 Thomson Avenue – First Floor Long Island City, NY 11101</b>
<b>DATE AND HOUR:</b>	<b>THURSDAY, SEPTEMBER 27, 2012 @ 2:00 PM</b>
	<b>LATE BIDS WILL NOT BE ACCEPTED</b>

<b>PLACE</b>	<b>Southwest Brooklyn Marine Transfer Station 1824 Shore Parkway Brooklyn, NY 11214</b>
<b>DATE AND HOUR</b>	<b>THURSDAY, AUGUST 23, 2012 AT 10:00AM</b>
<b>MANDATORY OR OPTIONAL</b>	<b>OPTIONAL</b>

**BID SECURITY:**

Bid Security is required in the amount set forth below; provided, however, bid security is not required if the TOTAL BID PRICE set forth on the Bid Form is less than \$1,000,000.

- (1) Bond in an amount not less than 10% of the TOTAL BID PRICE set forth on the Bid Form, OR
- (2) Certified Check in an amount not less than 2% of the TOTAL BID PRICE set forth on the Bid Form

**PERFORMANCE AND PAYMENT SECURITY:**

Required for Contracts in excess of \$1,000,000.00. Performance and Payment Security shall each be in an amount equal to 100% of the Contract Price

**AGENCY CONTACT PERSON:****Lorraine Holley, 30-30 Thomson Avenue - First Floor, Long Island City, Queens, NY 11101****Telephone (718) 391-2200 or (718) 391-1014****Fax: (718) 391-2615**

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**BID BOOKLET  
PART B**

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## SAFETY QUESTIONNAIRE

The bidder must include, with its bid, all information requested on this Safety Questionnaire. Failure to provide a completed and signed Safety Questionnaire at the time of bid opening may result in disqualification of the bid as non-responsive.

### 1. Bidder Information:

Company Name: \_\_\_\_\_

DDC Project Number: \_\_\_\_\_

Company Size: \_\_\_\_\_ Ten (10) employees or less  
\_\_\_\_\_ Greater than ten (10) employees

\_\_\_\_\_ Company has previously worked for DDC

### 2. Type(s) of Construction Work

TYPE OF WORK	LAST 3 YEARS	THIS PROJECT
General Building Construction	_____	_____
Residential Building Construction	_____	_____
Nonresidential Building Construction	_____	_____
Heavy Construction, except building	_____	_____
Highway and Street Construction	_____	_____
Heavy Construction, except highways	_____	_____
Plumbing, Heating, HVAC	_____	_____
Painting and Paper Hanging	_____	_____
Electrical Work	_____	_____
Masonry, Stonework and Plastering	_____	_____
Carpentry and Floor Work	_____	_____
Roofing, Siding, and Sheet Metal	_____	_____
Concrete Work	_____	_____
Specialty Trade Contracting	_____	_____
Asbestos Abatement	_____	_____
Other (specify)	_____	_____

### 3. Experience Modification Rate:

The Experience Modification Rate (EMR) is a rating generated by the National Council of Compensation Insurance (NCCI). This rating is used to determine the contractor's premium for worker's compensation insurance. The contractor may obtain its EMR by contacting its insurance broker or the NCCI. If the contractor cannot obtain its EMR, it must submit a written explanation as to why.

The Contractor must indicate its Intrastate and Interstate EMR for the past three years. [Note: For contractors with less than three years of experience, the EMR will be considered to be 1.00].

YEAR	<u>INTRASTATE</u> RATE	<u>INTERSTATE</u> RATE
_____	_____	_____
_____	_____	_____
_____	_____	_____

If the Intrastate and/or Interstate EMR for any of the past three years is greater than 1.00, the contractor must attach, to this questionnaire, a written explanation for the rating and identify what corrective action was taken to correct the situation resulting in that rating.

#### 4. OSHA Information:

\_\_\_\_\_ Contractor has received a willful violation issued by OSHA or New York City Department of Buildings (NYCDOB) within the last three years.

\_\_\_\_\_ Contractor has had an incident requiring OSHA notification within 8 hours (i.e., fatality, or hospitalization of three or more employees).

The Occupational Safety and Health Act (OSHA) of 1970 requires employers with ten or more employees, on a yearly basis to complete and maintain on file the form entitled "Log of Work-related Injuries and Illnesses". This form is commonly referred to as the OSHA 300 Log (OSHA 200 Log for 2001 and earlier).

The OSHA 300 Log must be submitted for the last three years for contractors with more than ten employees.

The Contractor must indicate the total number of hours worked by its employees, as reflected in payroll records for the past three years.

The contractor must submit the Incident Rate for Lost Time Injuries (the Incident Rate) for the past three years. The Incident Rate is calculated in accordance with the formula set forth below. For each given year, the total number of incidents is the total number of non-fatal injuries and illnesses reported on the OSHA 300 Log. The 200,000 hours represents the equivalent of 100 employees working forty hours a week, fifty weeks per year.

$$\text{Incident Rate} = \frac{\text{Total Number of Incidents} \times 200,000}{\text{Total Number of Hours Worked by Employees}}$$

YEAR	TOTAL NUMBERS OF HOURS WORKED BY EMPLOYEES	INCIDENT RATE
_____	_____	_____
_____	_____	_____
_____	_____	_____

If the contractor's Incident Rate for any of the past three years is one point higher than the Incident Rate for the type of construction it performs (listed below), the contractor must attach, to this questionnaire, a written explanation for the relatively high rate.

General Building Construction	8.5
Residential Building Construction	7.0
Nonresidential Building Construction	10.2
Heavy Construction, except building	8.7
Highway and Street Construction	9.7
Heavy Construction, except highways	8.3
Plumbing, Heating, HVAC	11.3
Painting and Paper Hanging	6.9
Electrical Work	9.5
Masonry, Stonework and Plastering	10.5
Carpentry and Floor Work	12.2
Roofing, Siding, and Sheet Metal	10.3
Concrete Work	8.6
Specialty Trade Contracting	8.6

##### 5. Safety Performance on Previous DDC Project(s)

\_\_\_\_\_ Contractor previously audited by the DDC Office of Site Safety.

DDC Project Number(s): \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_ Accident on previous DDC Project(s).

\_\_\_\_\_ Fatality or Life-altering Injury on DDC Project(s) within the last three years.  
[Examples of a life-altering injury include loss of limb, loss of a sense (e.g., sight, hearing), or loss of neurological function].

Date: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of Owner, Partner, Corporate Officer)

Title: \_\_\_\_\_

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## Pre-Award Process

The bidder is advised that as part of the pre-award review of its bid, it may be required to submit the information described in Sections (A) through (D) below. If required, the bidder must submit such information within five (5) business days following receipt of notification from DDC that it is among the low bidders. Such notification from DDC will be by facsimile or in writing and will specify the types of information which must be submitted.

**In the event the bidder fails to submit the required information within the specified time frame, its bid may be rejected as nonresponsive.**

\*\*\*\*\*

- (A) **Project Reference Form:** If required, the bidder must complete and submit the Project Reference Form set forth on pages 28 through 30 of this Bid Booklet. The Project Reference Form consists of 3 parts: (1) Similar Contracts Completed by the Bidder, (2) Contracts Currently Under Construction by the Bidder, and (3) Pending Contracts Not Yet Started by the Bidder.
- (B) **Copy of License:** If required, the bidder must submit a copy of the license under which the bidder will be performing the work. Such license must clearly show the following: (1) Name of the Licensee, (2) License Number, and (3) Expiration date of the License. A copy of the license will be required from bidders for the following contracts: Plumbing Work, Electrical Work and Asbestos Abatement.
- (C) **Financial Information:** If required, the bidder must submit the financial information described below:

- (1) **Audited Financial Statements:** Financial statements (Balance Sheet and Income Statement) of the entity submitting the bid, as audited by an independent auditor licensed to practice as a certified public accountant (CPA). Audited financial statements for the three most recent fiscal years must be submitted. Each such financial statement must include the auditor's standard report.

If the bidder does not have audited financial statements, it must submit an affidavit attesting to the fact that the bidder does not have such statements. In addition, the bidder must submit the following documentation covering the three most recent fiscal years: signed federal tax returns, unaudited financial statements, and a "certified review letter" from a certified public accountant (CPA) verifying the unaudited financial statements.

Unless the most recent audited or unaudited financial statement was issued within ninety (90) days, the bidder must submit interim financial information that includes data on financial position and results of operation (income data) for the current fiscal year. Such information may be summarized on a monthly or quarterly basis or at other intervals.

- (2) **Schedule of Aged Accounts Receivable,** including portion due within ninety (90) days.
- (D) **Project Specific Information:** If required, the bidder must submit the project specific information described below:
- (1) Statement indicating the number of years of experience the bidder has had and in what type of construction.
- (2) Resumes of all key personnel to be involved in the project, including the proposed project superintendent.
- (3) List of significant pieces of equipment expected to be used for the contract, and whether such equipment is owned or leased.

- (4) Description of work expected to be subcontracted, and to what firms, if known.
- (5) List of key material suppliers.
- (6) Preliminary bar chart time schedule
- (7) Contractor's expected means of financing the project. This should be based on the assumption that the contractor is required to finance 2X average monthly billings throughout the contract period.
- (8) Any other issues the contractor sees as impacting his ability to complete the project according to the contract.

In addition to the information described in Sections (A) through (D) above, the bidder shall submit such additional information as the Commissioner may require, including without limitation, an explanation or justification for specific unit price items.

The bidder is further advised that it may be required to attend a pre-award meeting with DDC representatives. If such a meeting is convened, the bidder will be advised as to any additional material to be provided.

**A. PROJECT REFERENCES – SIMILAR CONTRACTS COMPLETED BY THE BIDDER**

List all contracts substantially completed within the last 4 years similar to the contract being awarded, up to a maximum of 10, in descending order of date of substantial completion.

Project & Location	Contract Type	Contract Amount (\$000)	Date Completed	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner

**B. PROJECT REFERENCES – CONTRACTS CURRENTLY UNDER CONSTRUCTION BY THE BIDDER**

List all contracts currently under construction even if they are not similar to the contract being awarded.

Project & Location	Contract Type	Contract Amount (\$000)	Subcontracted to Others (\$000)	Uncompleted Portion (\$000)	Date Scheduled to Complete	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner

**C. PROJECT REFERENCES – PENDING CONTRACTS NOT YET STARTED BY THE BIDDER**

List all contracts awarded to or won by the bidder but not yet started.

Project & Location	Contract Type	Contract Amount (\$000)	Date Scheduled to Start	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner

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**OFFICE OF THE MAYOR  
BUREAU OF LABOR SERVICES  
CONTRACT CERTIFICATE**

To be completed if the contract is less than \$1,000,000

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name and Title of Signatory: \_\_\_\_\_  
\_\_\_\_\_

Contracting Agency or Owner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Proposed Contract Amount: \_\_\_\_\_

Description and Address of Proposed Contract: \_\_\_\_\_

Names of Subcontractors in the amount of 750,000 or more on this contract (if not known at this time, so state indicating that trades will be subcontracted):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I, (fill in name of person signing) \_\_\_\_\_,  
hereby affirm that I am authorized by the above-named contractor to certify that said contractor's proposed contract with the above-named owner or city agency is less than \$1,000,000. This affirmation is made in accordance with Executive Order No. 50 (1980) as amended and its implementing regulations.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

**WILLFUL OR FRAUDULENT FALSIFICATION OF ANY DATA OR INFORMATION SUBMITTED HERewith MAY RESULT IN THE TERMINATION OF ANY CONTRACT BETWEEN THE CITY AND THE BIDDER OR CONTRACTOR AND BAR THE BIDDER OR CONTRACTOR FROM PARTICIPATION IN ANY CITY CONTRACT FOR A PERIOD OF UP TO THREE YEARS. FURTHER, SUCH FALSIFICATION MAY RESULT IN CRIMINAL PROSECUTION.**

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## VENDEX COMPLIANCE

(A) **Vendex Fees:** Pursuant to Procurement Policy Board Rule 2-08(f)(2), the contractor will be charged a fee for administration of the VENDEX system, including the Vendor Name Check process, if a Vendor Name Check review is required to be conducted by the Department of Investigation. The contractor shall also be required to pay the applicable required fees for any of its subcontractors for which Vendor Name Check reviews are required. The fee(s) will be deducted from payments made to the contractor under the contract. For contracts with an estimated value of less than or equal to \$1,000,000, the fee will be \$175 per Vendor Name Check review. For contracts with an estimated value of greater than \$1,000,000, the fee will be \$350 per Vendor Name Check review.

(B) **Confirmation of Vendex Compliance:** The Bidder shall submit this Confirmation of Vendex Compliance to the Department of Design and Construction, Contracts Section, 30-30 Thomson Avenue – First Floor, Long Island City, NY 11101.

**Bid Information:** The Bidder shall complete the bid information set forth below.

Name of Bidder: \_\_\_\_\_  
Bidder's Address: \_\_\_\_\_  
Bidder's Telephone Number: \_\_\_\_\_  
Bidder's Fax Number: \_\_\_\_\_  
Date of Bid Opening: \_\_\_\_\_  
Project ID: \_\_\_\_\_

**Vendex Compliance:** To demonstrate compliance with Vendex requirements, the Bidder shall complete either Section (1) or Section (2) below, whichever applies.

(1) **Submission of Vendex Questionnaires to MOCS:** By signing in the space provided below, the Bidder certifies that as of the date specified below, the Bidder has submitted Vendex Questionnaires to the Mayor's Office of Contract Services, Attn: VENDEX, 253 Broadway, 9<sup>th</sup> Floor, New York, New York 10007.

Date of Submission: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of Partner or corporate officer)

Print Name: \_\_\_\_\_

(2) **Submission of Certification of No Change to DDC:** By signing in the space provided below, the Bidder certifies that it has read the instructions in a "Vendor's Guide to Vendex" and that such instructions do not require the Bidder to submit Vendex Questionnaires. The Bidder has completed **TWO ORIGINALS** of the Certification of No Change set forth on the next page of this Bid Booklet.

By: \_\_\_\_\_  
(Signature of Partner or corporate officer)

Print Name: \_\_\_\_\_

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**DIRECTIONS: Please execute two originals (both with original signature).  
Please forward directly to the agency (not M.O.C.S.).**

**CERTIFICATION OF NO CHANGE**

A MATERIALLY FALSE STATEMENT WILLFULLY OR FRAUDULENTLY MADE IN CONNECTION WITH THIS CERTIFICATION, AND/OR THE FAILURE TO CONDUCT APPROPRIATE DUE DILIGENCE IN VERIFYING THE INFORMATION THAT IS THE SUBJECT MATTER OF THIS CERTIFICATION, MAY RESULT IN RENDERING THE SUBMITTING ENTITY NON-RESPONSIBLE FOR THE PURPOSE OF CONTRACT AWARD, AND A MATERIALLY FALSE STATEMENT WILLFULLY OR FRAUDULENTLY MADE IN CONNECTION WITH THIS CERTIFICATION MAY SUBJECT THE PERSON MAKING THE FALSE STATEMENT TO CRIMINAL CHARGES.

I, \_\_\_\_\_, being duly sworn, state that I have read and understand all the items contained in the \_\_\_\_\_ questionnaire, dated \_\_\_\_\_ [if applicable: and the submission(s) dated \_\_\_\_\_, updating the information in that questionnaire]; and that, to the best of my knowledge, information and belief, the answers contained in the \_\_\_\_\_ questionnaire [if applicable: as modified by the submission(s) dated \_\_\_\_\_,] are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate. I further certify on behalf of the **submitting vendor** that the information contained in the **principal questionnaires** for \_\_\_\_\_, dated \_\_\_\_\_, \_\_\_\_\_, dated \_\_\_\_\_, \_\_\_\_\_, dated \_\_\_\_\_, [if applicable: and the submission(s) dated \_\_\_\_\_, updating the information in those questionnaires] has been verified and continues to the best of my knowledge to be full, complete and accurate. I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

Submitting entity \_\_\_\_\_  
Are you submitting this Certification as a parent? ☐ Yes / ☐ No  
EIN/TIN \_\_\_\_\_  
Address \_\_\_\_\_  
Agency \_\_\_\_\_

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

County License Issued \_\_\_\_\_

License Number \_\_\_\_\_

BY \_\_\_\_\_  
Print name \_\_\_\_\_

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

ON BEHALF OF \_\_\_\_\_  
Name of submitting entity

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**DIRECTIONS: Please execute two originals (both with original signature).**  
**Please forward directly to the agency (not M.O.C.S.).**

**CERTIFICATION OF NO CHANGE**

A MATERIALLY FALSE STATEMENT WILLFULLY OR FRAUDULENTLY MADE IN CONNECTION WITH THIS CERTIFICATION, AND/OR THE FAILURE TO CONDUCT APPROPRIATE DUE DILIGENCE IN VERIFYING THE INFORMATION THAT IS THE SUBJECT MATTER OF THIS CERTIFICATION, MAY RESULT IN RENDERING THE SUBMITTING ENTITY NON-RESPONSIBLE FOR THE PURPOSE OF CONTRACT AWARD, AND A MATERIALLY FALSE STATEMENT WILLFULLY OR FRAUDULENTLY MADE IN CONNECTION WITH THIS CERTIFICATION MAY SUBJECT THE PERSON MAKING THE FALSE STATEMENT TO CRIMINAL CHARGES.

I, \_\_\_\_\_, being duly sworn, state that I have read and understand all the items contained in the \_\_\_\_\_ questionnaire, dated \_\_\_\_\_ [if applicable: and the submission(s) dated \_\_\_\_\_, updating the information in that questionnaire]; and that, to the best of my knowledge, information and belief, the answers contained in the \_\_\_\_\_ questionnaire [if applicable: as modified by the submission(s) dated \_\_\_\_\_,] are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate. I further certify on behalf of the **submitting vendor** that the information contained in the **principal questionnaires** for \_\_\_\_\_, dated \_\_\_\_\_, \_\_\_\_\_, dated \_\_\_\_\_, \_\_\_\_\_, dated \_\_\_\_\_, [if applicable: and the submission(s) dated \_\_\_\_\_, updating the information in those questionnaires] has been verified and continues to the best of my knowledge to be full, complete and accurate. I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

Submitting entity \_\_\_\_\_  
Are you submitting this Certification as a parent? ☐ Yes / ☐ No  
EIN/TIN \_\_\_\_\_  
Address \_\_\_\_\_  
Agency \_\_\_\_\_

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

County License Issued \_\_\_\_\_

License Number \_\_\_\_\_

BY \_\_\_\_\_  
Print name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

ON BEHALF OF \_\_\_\_\_  
Name of submitting entity

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## **IRAN DIVESTMENT ACT COMPLIANCE RIDER**

### **FOR NEW YORK CITY CONTRACTORS**

The Iran Divestment Act of 2012, effective as of April 12, 2012, is codified at State Finance Law ("SFL") §165-a and General Municipal Law ("GML") §103-g. The Iran Divestment Act, with certain exceptions, prohibits municipalities, including the City, from entering into contracts with persons engaged in investment activities in the energy sector of Iran. Pursuant to the terms set forth in SFL §165-a and GML §103-g, a person engages in investment activities in the energy sector of Iran if:

- (a) The person provides goods or services of twenty million dollars or more in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran; or
- (b) The person is a financial institution that extends twenty million dollars or more in credit to another person, for forty-five days or more, if that person will use the credit to provide goods or services in the energy sector in Iran and is identified on a list created pursuant to paragraph (b) of subdivision three of Section 165-a of the State Finance Law and maintained by the Commissioner of the Office of General Services.

A bid or proposal shall not be considered for award nor shall any award be made where the bidder or proposer fails to submit a signed and verified bidder's certification.

Each bidder or proposer must certify that it is not on the list of entities engaged in investment activities in Iran created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law. In any case where the bidder or proposer cannot certify that they are not on such list, the bidder or proposer shall so state and shall furnish with the bid or proposal a signed statement which sets forth in detail the reasons why such statement cannot be made. The City of New York may award a bid to a bidder who cannot make the certification on a case by case basis if:

- (1) The investment activities in Iran were made before the effective date of this section (i.e., April 12, 2012), the investment activities in Iran have not been expanded or renewed after the effective date of this section and the person has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran: or
- (2) The City makes a determination that the goods or services are necessary for the City to perform its functions and that, absent such an exemption, the City would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

**BIDDER'S CERTIFICATION OF COMPLIANCE WITH  
IRAN DIVESTMENT ACT**

Pursuant to General Municipal Law §103-g, which generally prohibits the City from entering into contracts with persons engaged in investment activities in the energy sector of Iran, the bidder/proposer submits the following certification:

*[Please Check One]*

**BIDDER'S CERTIFICATION**

- ☐ By submission of this bid or proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief, that each bidder/proposer is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law.
- ☐ I am unable to certify that my name and the name of the bidder/proposer does not appear on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law. I have attached a signed statement setting forth in detail why I cannot so certify.

Dated: \_\_\_\_\_, New York  
\_\_\_\_\_, 20\_\_

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
PRINTED NAME

\_\_\_\_\_  
TITLE

Sworn to before me this  
\_\_\_\_ day of \_\_\_\_\_, 20\_\_

\_\_\_\_\_  
Notary Public

Dated:



**CITY OF NEW YORK**

**DIVISION OF LABOR SERVICES**

**CONSTRUCTION EMPLOYMENT REPORT**

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## Division of Labor Services

### CONSTRUCTION EMPLOYMENT REPORT

#### GENERAL INFORMATION

1. Your contractual relationship in this contract is: Prime Contractor \_\_\_\_\_ Subcontractor \_\_\_\_\_
- 1a. Are M/WBE goals attached to this project? Yes \_\_\_\_\_ No \_\_\_\_\_
2. Would your company like information on how to certify with the City of New York as a:  
\_\_\_\_\_ Minority Owned Business Enterprise \_\_\_\_\_ Locally based Business Enterprise  
\_\_\_\_\_ Women Owned Business Enterprise \_\_\_\_\_ Emerging Business Enterprise  
\_\_\_\_\_ Disadvantaged
3. Please indicate if you would like assistance from SBS in identify certified M/WBEs for contracting opportunities: Yes \_\_\_\_\_ No \_\_\_\_\_
4. Is this project subject to a Project labor Agreement? Yes \_\_\_\_\_ No \_\_\_\_\_

#### PART I: CONTRACTOR/SUBCONTRACTOR INFORMATION

5. \_\_\_\_\_  
Employer Identification Number or Federal Tax I.D.
6. \_\_\_\_\_  
Company Name
7. \_\_\_\_\_  
Street Address City State Zip Code
8. \_\_\_\_\_  
(Chief Operating Officer) First Name Last Name Telephone Number Fax Number
9. \_\_\_\_\_  
Designated Equal Opportunity Compliance Officer (if same as Item #8, write "Same") Telephone Number
10. \_\_\_\_\_  
Name of Prime Contractor and Contact Person (if same as item #6, write "Same")
11. Number of employees in your company: \_\_\_\_\_
12. Contract information:  
(a) \_\_\_\_\_ Contracting Agency (City Agency)  
(b) \_\_\_\_\_ Contract Amount  
(c) \_\_\_\_\_ Procurement Identification Number (PIN)  
(d) \_\_\_\_\_ Contract Registration Number (CT#)  
(e) \_\_\_\_\_ Project Commence Date  
(f) \_\_\_\_\_ Projected Completion Date

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(g) Description and location of proposed contract:

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13. Has your firm been reviewed by the Division of Labor Services (DLS) within the past 36 months and issued a Certificate of Approval? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a copy of the certificate.

14. Has DLS within the past month reviewed an Employment Report submission for your company and issued a Conditional Certificate of Approval? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a copy of the certificate.

**NOTE: DLS WILL NOT ISSUE A CONTINUED CERTIFICATE OF APPROVAL IN CONNECTION WITH THIS CONTRACT UNLESS THE REQUIRED CORRECTIVE ACTIONS IN PRIOR CONDITIONAL CERTIFICATES OF APPROVAL HAVE BEEN TAKEN**

15. Has an Employment Report already been submitted for a different contract (not covered by this Employment Report) for which you have not yet received compliance certificate? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes,

Date submitted: \_\_\_\_\_ Agency to which submitted: \_\_\_\_\_

Name of Agency Person: First Name \_\_\_\_\_ Last Name \_\_\_\_\_

Contract No. : \_\_\_\_\_ Telephone: \_\_\_\_\_

16. Has your company in the past 36 months been audited by the United States Department of Labor, Office of Federal Contract Compliance Programs (OFCCP)? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes,

(a) Name and address of OFCCP office: \_\_\_\_\_

(b) Was a Certificate of Equal Employment Compliance issued within the past 24 months? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a copy of such certificate.

(c) Were any corrective actions required or agreed to? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a copy of such requirements or agreements.

(d) Were any deficiencies found? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a copy of such findings.

17. Is your company or its affiliates a member or members of an employers' trade association which is responsible for negotiating collective bargaining agreements (CBA) which affect construction site hiring? Yes \_\_\_\_\_ No \_\_\_\_\_  
If Yes, attach a list of such associations and all applicable CBA's.

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## PART II: DOCUMENTS REQUIRED

18. For the following policies or practices, attach the relevant documents (e.g., printed booklets, brochures, manuals, memoranda, etc.) If the policy(ies) are unwritten, attach a full explanation of the practices. See instructions.

- ☐ (a) Health benefit coverage/description(s) for all management, nonunion and union employees (whether company or union administered)
- ☐ (b) Disability, life, other insurance coverage/description
- ☐ (c) Employee Policy/Handbook
- ☐ (d) Personnel Policy/Manual
- ☐ (e) Supervisor's Policy/Manual
- ☐ (f) Pension plan or 401k coverage/description for all management, nonunion and union employees, whether company or union administered.
- ☐ (g) Collective bargaining agreement(s)
- ☐ (h) Employment Application(s)
- ☐ (i) Employee evaluation policy/form(s)
- ☐ (j) Does your firm have medical and/or non-medical (i.e. education, military, personal, pregnancy, child care) leave policy?

19. To comply with the Immigration Reform and Control Act of 1986 when and of whom does your firm require the completion of an I-9 form?

- |  |                              |                             |
|--|------------------------------|-----------------------------|
| (a) Prior to job offer                     | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (b) After a conditional job offer          | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (c) After a job offer                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (d) Within the first three days on the job | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (e) To some applicants                     | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (f) To all applicants                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (g) To some employees                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (h) To all employees                       | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

20. Explain where and how completed I-9 Forms, with their supportive documentation are maintained and made accessible.

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21. Does your firm or any of its collective bargaining agreements require job applicants to take a medical examination?  
Yes ☐ No ☐

If Yes, is the medical examination given:

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- |                                   |           |          |
|-----------------------------------|-----------|----------|
| (a) Prior to the job offer        | Yes _____ | No _____ |
| (b) After a conditional job offer | Yes _____ | No _____ |
| (c) After a job offer             | Yes _____ | No _____ |
| (d) To all applicants             | Yes _____ | No _____ |
| (e) Only to some applicants       | Yes _____ | No _____ |

If Yes, list for which applicants below and attach copies of all medical examination or questionnaire forms and instructions utilized for these examinations.

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22. Do you have a written equal opportunity (EEO) policy? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, list the document(s) and page number(s) where these written policies are located.

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23. Does the company have a current affirmative action plan(s) (AAP)

\_\_\_\_\_ Minorities and Women  
 \_\_\_\_\_ Individuals with handicaps  
 \_\_\_\_\_ Other. Please specify \_\_\_\_\_

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24. Does your firm or collective bargaining agreement(s) have an internal grievance procedure with respect to EEO complaints? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, please attach a copy of this policy.

If No, attach a report detailing your firm's unwritten procedure for handling EEO complaints.

25. Has any employee, within the past three years, filed a complaint pursuant to an internal grievance procedure or with any official of your firm with respect to equal employment opportunity? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach an internal complaint log. See instructions.

26. Has your firm, within the past three years, been named as a defendant (or respondent) in any administrative or judicial action where the complainant (plaintiff) alleged violation of any anti-discrimination or affirmative action laws? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, attach a log. See instructions.

27. Are there any jobs for which there are physical qualification? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, list the job(s), submit a job description and state the reason(s) for the qualification(s).

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28. Are there any jobs for which there are age, race, color, national origin, sex, creed, disability, marital status, sexual orientation, or citizenship qualifications? Yes \_\_\_\_\_ No \_\_\_\_\_

If Yes, list the job(s), submit a job description and state the reason(s) for the qualification(s).

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FORM A. CONTRACT BID INFORMATION: USE OF SUBCONTRACTORS/TRADES

1. Do you plan to subcontract work on this contract? Yes ☐ No ☐
2. If yes, complete the chart below.

NOTE: All proposed subcontractors with a subcontract in excess of \$1,000,000 must complete an Employment Report for review and approval before the contract may be awarded and work commences.

SUBCONTRACTOR'S NAME*	OWNERSHIP (ENTER APPROPRIATE CODE LETTERS BELOW)	WORK TO BE PERFORMED BY SUBCONTRACTOR	TRADE PROJECTED FOR USE BY SUBCONTRACTOR	PROJECTED DOLLAR VALUE OF SUBCONTRACT

\*If subcontractor is presently unknown, please enter the trade (craft name).

Ownership codes: W: White A: Asian B: Black N: Native American H: Hispanic F: Female



Small Business  
Services

## Division of Labor Services

### FORM B: PROJECTED WORKFORCE TRADE CLASSIFICATION CODES

(J) Journey level Workers (A) Apprentice  
(H) Helper (TRN) Trainee  
(TOT) Total by Column

For each trade to be engaged by your company for  
this project, enter the projected workforce for  
**Males** and **Females** by trade classification on  
the charts below.

Trade: _____	Males					Females				
	(1) White Non Hisp.	(2) Black Non Hisp.	(3) Hisp.	(4) Asian	(5) Native Amer.	(6) White Non Hisp.	(7) Black Non Hisp.	(8) Hisp.	(9) Asian	(10) Native Amer.
Union Affiliation, if applicable: _____										
Total (Col. #1-10): _____ J										
Total Minority, Male & Female H (Col. #2, 3, 4, 5, 7, 8, 9 & 10)										
A										
Total Female TRN										
(Col. #6 - 10): _____										
TOT										

What are the recruitment sources for you projected hires (i.e., unions, government employment office, job tap center, community outreach)? \_\_\_\_\_

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Small Business  
Services

## Division of Labor Services

### FORM B: PROJECTED WORKFORCE TRADE CLASSIFICATION CODES

(J) Journey level Workers (A) Apprentice  
(H) Helper (TRN) Trainee  
(TOT) Total by Column

For each trade to be engaged by your company for  
this project, enter the projected workforce for  
**Males** and **Females** by trade classification on  
the charts below.

Trade: _____	Males						Females								
	(1) White		(2) Black		(3) Hisp.	(4) Asian	(5) Native Amer.	(6) White		(7) Black		(8) Hisp.	(9) Asian	(10) Native Amer.	
	Non Hisp.	Hisp.	Non Hisp.	Hisp.				Non Hisp.	Hisp.	Non Hisp.	Hisp.				
Total (Col. #1-10): _____	J														
Total Minority, Male & Female (Col. #2, 3, 4, 5, 7, 8, 9 & 10) _____	H														
Total Female (Col. #6 - 10): _____	A														
	TRN														
	TOT														

What are the recruitment sources for you projected hires (i.e., unions, government employment office, job tap center, community outreach)? \_\_\_\_\_

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Small Business  
Services

## Division of Labor Services

### FORM C: CURRENT WORKFORCE TRADE CLASSIFICATION CODES

(J) Journey level Workers (A) Apprentice  
(H) Helper (TRN) Trainee  
(TOT) Total by Column

For each trade to be engaged by your company for  
this project, enter the projected workforce for  
**Males** and **Females** by trade classification on  
the charts below.

Trade: _____	Males					Females						
	(1) White Non Hisp.		(2) Black Non Hisp.		(3)	(4)	(5)	(6) White Non Hisp.	(7) Black Non Hisp.	(8)	(9)	(10) Native Amer.
Union Affiliation, if applicable: _____												
Total (Col. #1-10): _____												
Total Minority, Male & Female H (Col. #2, 3, 4, 5, 7, 8, 9 & 10)												
A _____												
Total Female (Col. #6 - 10): _____												
TOT _____												

What are the recruitment sources for you projected hires (i.e., unions, government employment office, job tap center, community outreach)? \_\_\_\_\_

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Revised 1-99



# Division of Labor Services

Small Business  
Services

## FORM C: CURRENT WORKFORCE TRADE CLASSIFICATION CODES

(J) Journey level Workers (A) Apprentice  
(H) Helper (TRN) Trainee  
(TOT) Total by Column

For each trade to be engaged by your company for  
this project, enter the projected workforce for  
**Males** and **Females** by trade classification on  
the charts below.

Trade: _____	Males					Females				
	(1) White Non Hisp.	(2) Black Non Hisp.	(3) Hisp.	(4) Asian	(5) Native Amer.	(6) White Non Hisp.	(7) Black Non Hisp.	(8) Hisp.	(9) Asian	(10) Native Amer.
Union Affiliation, if applicable: _____										
Total (Col. #1-10): J										
Total Minority, Male & Female (Col. #2, 3, 4, 5, 7, 8, 9 & 10) H										
A										
Total Female (Col. #6 - 10): TRN										
TOT										

What are the recruitment sources for you projected hires (i.e., unions, government employment office, job tap center, community outreach)? \_\_\_\_\_

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**Small Business  
Services**

# Division of Labor Services

Date \_\_\_\_\_

File Number \_\_\_\_\_

## LESS THAN \$750,000 SUBCONTRACT CERTIFICATE

Are you currently certified as one of the following? Please check yes or no:

**M/WBE** Yes \_\_\_\_\_ No \_\_\_\_\_  
**WBE** Yes \_\_\_\_\_ No \_\_\_\_\_

**MBE** Yes \_\_\_\_\_ No \_\_\_\_\_  
**LBE** Yes \_\_\_\_\_ No \_\_\_\_\_

If you are certified as an **M/WBE, MBE, WBE,**  
or **LBE**, what city/state agency are you certified with? \_\_\_\_\_

Please check one of the following if your firm would like information on how to certify with  
the City of New York as a:

☐ **Minority Owned Business Enterprise**      ☐ **Locally based Business Enterprise**  
☐ **Women Owned Business Enterprise**

Company Name

Employer Identification Number or Federal Tax I.D.

Company Address and Zip Code

Contact Person (First Name, Last Name)

Telephone Number

Fax Number

E-mail Address

Contracting Agency

Description and location of proposed subcontract:

Borough

Project Number

Pin Number

Contract Amount

I, (print name of authorized official signing) \_\_\_\_\_ hereby certify that I  
am authorized by the above-named subcontractor to certify that said subcontractor's proposed contract  
with the above named owner or City agency is less than \$750,000.

Willful or fraudulent falsifications of any data or information submitted herewith may result in the  
termination of the contract between the City and the bidder or contractor and in disapproval of future  
contracts for a period of up to five years. Further, such falsification may result in civil and/or  
criminal prosecution.

Signature of authorized official

Date

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## SIGNATURE PAGE

I, (print name of authorized official signing) \_\_\_\_\_ hereby certify that the information submitted herewith is true and complete to the best of my knowledge and belief and submitted with the understanding that compliance with New York City's equal employment requirements, as contained in Chapter 56 of the City Charter, Executive Order No. 50 (1980), as amended, and the implementing Rules and Regulations, is a requirement for the contractors and subcontractors working on this construction project. I also agree on behalf of the company to submit a certified copy of payroll records to the Division of Labor Services on a monthly basis.

\_\_\_\_\_  
*Contractor's Name*

\_\_\_\_\_  
*Name of person who prepared this Employment Report*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Name of official authorized to sign on behalf of the contractor*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Telephone Number*

\_\_\_\_\_  
*Signature of authorized official*

\_\_\_\_\_  
*Date*

If contractors are found to be underutilizing minorities and females in any given trade based on Chapter 56 Section 3H, the Division of Labor Services reserves the right to request the contractor's workforce data and to implement an employment program.

Contractors who fail to comply with the above mentioned requirements or are found to be in noncompliance may be subject to the withholding of final payment.

Willful or fraudulent falsifications of any data or information submitted herewith may result in the termination of the contract between the City and the bidder or contractor and in disapproval of future contracts for a period of up to five years. Further, such falsification may result in civil and/or criminal prosecution.

To the extent permitted by law and consistent with the proper discharge of DLS' responsibilities under Charter Chapter 56 of the City Charter and Executive Order No. 50 (1980) and the implementing Rules and Regulations, all information provided by a contractor to DLS shall be confidential.

**Please attach your M/WBE Compliance Report.**

**Only original signatures accepted.**

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

\_\_\_\_\_  
*Authorized Signature*

\_\_\_\_\_  
*Notary Public*

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Revised 11/10



## Division of Labor Services

### WHO MUST FILE AN EMPLOYMENT REPORT

An Employment Report (ER) must be filed if you meet the following conditions:

CONTRACTOR	CONTRACT VALUE	Submission Requirement
Prime Contractor	\$1,000,000 or greater ( <i>city, state</i> )	Construction Employment Report
	\$10,000 or greater ( <i>federally and/or federally assisted</i> )	
Subcontractor	\$750,000 or greater	Construction Employment Report
	Less than \$750,000	Less than \$750,000 Certificate
	\$10,000 or greater ( <i>federally and/or federally assisted</i> )	Construction Employment Report

### WHERE TO FILE

ERs must be filed directly with the Division of Labor Services (DLS).

### DLS REVIEW PROCESS

In accordance with Executive Order 50 (EO 50), upon receipt by DLS of a completed ER, DLS conducts a review of the contractor's current employment policies, practices and procedures, as well as perform a statistical analysis of the contractor's workforce, if necessary. The process is as follows:

1. Within five (5) business days, DLS will review the ER for completeness and accuracy. If any information is omitted or incorrect, or if necessary documents are not submitted, the submission shall be deemed incomplete and DLS will inform the contractor. The substantive compliance review does not commence until the submission is complete. **An incomplete submission will delay the review process and may preclude or interrupt the contract approval.**

- 1a. If the City is allocating funds to this project, you must provide the name of the contracting agency.

2. If the ER submission is complete, the compliance review will proceed, resulting in one of the following:

#### Certificate of Approval

The contractor is found to be in compliance with all applicable laws and regulations. The approval is valid for 36 months.

#### Continued Approval Certificate

The contractor has been issued a Certificate of Approval in the previous 36 months which is good for the applicable contract.

#### Conditional Certificate of Compliance

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The contractor is required to take corrective actions in order to be in compliance with EO 50. The contractor must meet the conditions within three months of the issue of the Conditional Certificate.

### **Determination of Nonperformance**

The contractor has failed to take the required corrective actions stipulated in the Conditional Certificate. A determination of nonperformance may prevent a contractor from receiving an DLS Approval.

3. Please indicate if you would like assistance from SBS in identifying certified M/WBEs for contracting opportunities.

3a. Please provide a copy of your project labor agreement which is negotiated through an employer trade association.

## **HOW TO COMPLETE THE EMPLOYMENT REPORT**

### **Contents**

#### **General Information**

**Part I: Company/Contract Information**

**Part II: Employment Policies and Practices**

**Part III: Contract Bid Information and Projected and Current Workforce Forms**

**Signature Page**

## **PART I: CONTRACTOR/SUBCONTRACTOR INFORMATION**

Question 5: Please provide the Employer Identification Number or Federal Tax I.D.

Questions 6 – 9: Please provide the requested company information. All contracts must have a designated Equal Employment Officer.

Question 10: If you are a subcontractor, you must state the name of the contractor for whom you are providing the construction services.

Question 11: Please indicate how many employees are in your company.

Question 12 (a-f): Please provide all relevant information requested in 12 (a) to (f).

Question 12(g): Provide a description of the trade work you will perform on this project and the address where the work will be performed. Subcontractors can obtain this information from the contract they have with their contractor.

Questions 13 – 15: If your company has received a valid Certificate of Approval within the past 36 months, been audited by the United States Department of Labor, Office of Federal Contract Compliance Programs (OFCCP), or if your company has submitted an ER for a different contract for which you have not yet received a compliance certificate, then you only need to complete and submit the following:

- General Information section
- Part I - Contractor/Subcontractor Information
- Form B - Projected Workforce
- Signature Page

If your company is currently waiting for an approval on another contract previously submitted, be certain to identify the date on which you submitted the completed Employment Report, the name of the City contracting agency with which the contract was made, and the name and telephone number of the person to whom the Employment Report was submitted.

If your company was issued a Conditional Certificate of Approval, all required corrective actions must have been taken or DLS will not issue a Continued Certificate.

Question 16: If the company was audited by the OFCCP, also provide the following:

- Identify the reviewing OFCCP office by its name and address
- If an unconditional certificate of compliance was issued by the OFCCP, attach a copy of the certificate in lieu of completing Parts II and III;

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- Include copies of all corrective actions and documentation of OFCCP's performance; and
- Provide a copy of all stated OFCCP findings.

Question 17: Please provide a copy of any Collective Bargaining Agreement(s) which is negotiated through an employer trade association on behalf of your organization or any of its affiliates.

## **PART II: EMPLOYMENT POLICIES AND PRACTICES**

*Remember to label all documents with the question number for which they are submitted.*

Questions 18a – j: You must respond to the questions as to whether or not your firm has documents reflecting written policies, benefits and procedures. If so, then you must identify by name each document in which the policy(ies), procedure(s) and benefit(s) is located and submit copies of all of the document(s). If your firm follows unwritten practices or procedures, include an explanation of how they operate. Please submit the most current document(s), including all applicable amendments. Label each document and/or unwritten practice according to the question to which it corresponds (e.g. 18a, 18b, etc.)

Questions 19a – h: Inquires about the manner/methods by which you comply with the requirements of the Immigration Reform and Control Act of 1986 (IRCA).

Question 20: Inquires into where and how I-9 forms are maintained and stored.

Questions 21a – e: Inquires into whether or not there is a requirement that an applicant or employee be subjected to a medical examination at any given time. Copies of the medical information questionnaire and instructions must be submitted with the Employment Report.

Question 22: Indicate the existence and location of all statements of your firm's Equal Employment Opportunity policy and attach a copy of each statement.

Question 23: Submit any current Affirmative Action Plan(s) created pursuant to Executive Order 11246.

Question 24: If your firm or collective bargaining agreement has an internal grievance procedure, indicate this and submit a copy of the policy and procedure. If unwritten, explain its nature and operation. Explain how your firm's procedure addresses EEO complaints.

Question 25: If your employees have used the procedure in the last three (3) years, please submit an explanation in the format indicated below:

1. Number of complaint(s)	2. Nature of the complaint(s)	3. Position(s) of the complainant(s)	4. Was an investigation conducted? Y/N	5. Current status of the disposition
---------------------------	-------------------------------	--------------------------------------	---	--------------------------------------

Question 26: Indicate whether in the past three (3) years complaints have been filed with a court of law or administrative agency, naming your company as a defendant (or respondent) in a complaint alleging violation of any anti-discrimination or affirmative action laws. If yes, develop and submit a log to show, for each administrative/and or judicial action filed, the following information:

1. Name(s) of complainant(s)	2. Administrative agency or court in which action was filed	3. Nature of the complaint(s)	4. Current status	5. If not pending, the complaint's disposition
------------------------------	---	-------------------------------	-------------------	--

Question 27: Identify each job for which a physical qualification exists. Identify and explain the physical qualification(s) for each stated job. Submit job descriptions for each job and the reasons for the qualifications.

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Question 28: Identify each job for which there exists any qualification related to age, race, color, national origin, sex, creed, disability, marital status, sexual orientation or citizenship status. Identify and explain the specific related qualification for each job stated. Submit job descriptions for each job and the reasons for the qualifications.

### PART III: CONTRACT BID INFORMATION AND PROJECTED AND CURRENT WORKFORCE FORMS

#### FORM A: CONTRACT BID INFORMATION – USE OF SUBCONTRACTORS/TRADES

Your projections for the utilization of subcontractors on the proposed contract are to be provided in this section. A chart has been provided for the identification of subcontractors. Information is to be provided to the extent known at the time the ER is filed for review by DLS. If the subcontractor's name is unknown, then write "unknown". Under "ownership", enter the appropriate race/ethnic and gender code. If the contract is federally funded or assisted and the subcontractor is being utilized in accordance with applicable federal requirements with respect to Minority Business Enterprise or Woman Business Enterprise requirements, enter the appropriate code. This will also apply to state funded contracts with similar requirements for minority and female owned businesses.

#### FORM B: PROJECTED WORKFORCE FOR WORK TO BE PERFORMED ON THIS PROJECT

For each trade to be engaged by your company for this project, enter the projected workforce for Males and Females by trade classification in the charts provided.

#### FORM C: CURRENT WORKFORCE FOR WORK TO BE PERFORMED ON THIS PROJECT

For each trade *currently* engaged by your company for all work performed in NYC, enter the current workforce for Males and Females by trade classification in the charts provided.

### SIGNATURE PAGE

The signatory of this Employment Report and all other documents submitted to DLS must be an official authorized to enter into a binding legal agreement. The signature page must be completed in its entirety and notarized. Only original signatures will be accepted.

FOR OFFICIAL USE ONLY, File No \_\_\_\_\_



FMS ID: S216-399A



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**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS**

30-30 THOMSON AVENUE      LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000      WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

---

**Contract for Furnishing all Labor and Material Necessary and Required for:**

**CONTRACT NO. 1      GENERAL CONSTRUCTION WORK**

**Southwest Brooklyn Marine Transfer  
Station - Building Construction**

**LOCATION:                      1824 Shore Parkway  
BOROUGH:                  Brooklyn 11214  
CITY OF NEW YORK**

---

\_\_\_\_\_  
Contractor

Dated \_\_\_\_\_, 20\_\_\_\_

---

Entered in the Comptroller's Office

\_\_\_\_\_  
First Assistant Bookkeeper

Dated \_\_\_\_\_, 20\_\_\_\_





PROJECT ID: S216-399A

**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS**

30-30 THOMSON AVENUE  
LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000  
WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

**LAW**

**VOLUME 2 OF 3**

**PROJECT LABOR AGREEMENT  
INFORMATION FOR BIDDERS  
CONTRACT  
PERFORMANCE AND PAYMENT BONDS  
SCHEDULE OF PREVAILING WAGES  
GENERAL CONDITIONS**

FOR FURNISHING ALL LABOR AND MATERIALS  
NECESSARY AND REQUIRED FOR THE PROJECT

**Southwest Brooklyn Marine Transfer  
Station - Building Construction**

LOCATION:  
BOROUGH:  
CITY OF NEW YORK

1824 Shore Parkway  
Brooklyn 11214

CONTRACT NO. 1

GENERAL CONSTRUCTION WORK

New York City Department of Sanitation

Greeley & Hansen LLC

Date: July 10, 2012



**2-112**





**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS**

30-30 THOMSON AVENUE  
LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000  
WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

**VOLUME 2 OF 3**

**PROJECT LABOR AGREEMENT  
INFORMATION FOR BIDDERS  
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## **NOTICE:**

### **THIS CONTRACT IS NOT SUBJECT TO THE REQUIREMENTS OF THE WICKS LAW FOR SEPARATE PRIME CONTRACTORS**

This contract is subject to a Project Labor Agreement ("PLA"). In accordance with the Labor Law, the requirements of the Wicks Law for separate prime contractors do not apply to any project that is covered by a PLA. Accordingly, the requirements of the Wicks Law for separate prime contractors do not apply to this Project. However, the Contract Documents for this Project (General Conditions, Drawings and Specifications) were prepared as if the requirements of the Wicks Law for separate prime contractors did apply. To correct this situation, the bidder is advised that the Contract Documents are revised as set forth below.

- (A) Delete any and all references to separate responsibilities, separate specifications, separate drawings and/or separate contracts for the four subdivisions of the work listed below:
- General Construction Work (Contract No. 1)
  - Plumbing Work (Contract No. 2)
  - HVAC & Fire Protection Work (Contract No. 3)
  - Electrical Work (Contract No. 4)
- (B) Revise all such references to indicate that:
- The Project consists of a single contract, the Contract for General Construction Work.
  - All responsibilities and obligations in the Contract Documents assigned to the separate Contractors for the four subdivisions of the work listed above are the responsibility of the Contractor for General Construction Work.
  - The Contractor for General Construction Work is responsible for the performance of all required work for the Project as set forth in the Contract Documents, including all responsibilities and obligations assigned to the separate Contractors for the four subdivisions of the work listed above.
- (C) Revise any and all references to Contracts Nos. 2, 3 and 4 to refer to Contract No. 1.
- (D) Revise the specifications for plumbing work to require Contractor for General Construction Work to engage a Licensed Plumber to perform the required plumbing work.
- (E) Revise the specifications for electrical work to require Contractor for General Construction Work to engage a Licensed Electrician to perform the required electrical work.

## **NOTICE:**

### **THIS CONTRACT IS SUBJECT TO A PROJECT LABOR AGREEMENT**

This contract is subject to the attached Project Labor Agreement ("PLA") entered into between the City and the Building and Construction Trades Council of Greater New York ("BCTC") affiliated Local Unions. By submitting a bid, the Contractor agrees that if awarded the Contract the PLA is binding on the Contractor and all subcontractors of all tiers. The bidder to be awarded the contract will be required to execute the attached Letter of Assent prior to award. Contractor shall include in any subcontract a requirement that the subcontractor, and sub-subcontractors of all tiers, become signatory to and bound to the PLA with respect to the subcontracted work. Contractor will also be required to have all subcontractors of all tiers execute the attached Letter of Assent prior to such subcontractors performing any work on the Project. Bidders are advised that the City of New York and City agencies have entered into multiple PLAs. The terms of each PLA, while similar, are not identical. All bidders should carefully read the entire PLA that governs this Contract.

To the extent that the terms of the PLA conflict with any other terms of the invitation for bids, including the Standard Construction Contract, the terms of the PLA shall govern. For example, the PLA section that authorizes the scheduling of a four-day work, ten hours per day on straight time at the commencement of the job, PLA Article 12, section 1, overrides the Standard Construction Contract's provision concerning a five-day work week with a maximum of eight hours in a day, Standard Construction Contract Article 37.2.1. Where, however, the invitation for bids, including the Standard Construction Contract, requires the approval of the City/Department, the PLA does not supersede or eliminate that requirement.

In addition to the various provisions regarding work rules, Contractors should take special note of the requirement that Contractors and Subcontractors make payments to designated employee benefit funds. See PLA Article 11, Section 2. The PLA also contains provisions for what occurs when a contractor or a subcontractor fails to make required payments into the benefit funds, including potentially the direct payment by the City to the benefit fund of monies owed and corresponding withholding of payments to the Contractor. See PLA Article 11, Section 2. The City strongly advises Contractors to read these provisions carefully and to include appropriate provisions in subcontracts addressing these possibilities.

This Contract is subject to the apprenticeship requirements of Labor Law §222 and to apprenticeship requirements established by the Department pursuant to Labor Law §816-b. Please be advised that the involved trades have apprenticeship programs that meet the statutory requirements of Labor Law 222(e) and the requirements set by the Department pursuant to Labor Law §816-b, contractors and subcontractors who agree to perform the Work pursuant to the PLA are participating in such apprenticeship programs within the meaning of Labor Law §222(e) and the Department's directive.

If this Contract is subject to the Minority-Owned and Women-Owned Business Enterprise ("M/WBE") program created by Local Law 129, the specific requirements of M/WBE participation for this Contract are set forth in Schedule B entitled the "Subcontractor Utilization Plan", and are detailed in a separate Notice to Prospective Contractors included with this bid package. If such requirements are included with this Contract, the City strongly advises Contractors to read those provisions, as well as PLA Article 4, Section 2(C), carefully. A list of M/WBE firms may be obtained from the DSBS website at [www.nyc.gov/buycertified](http://www.nyc.gov/buycertified), by emailing DSBS at [buyer@sbs.nyc.gov](mailto:buyer@sbs.nyc.gov), by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7th floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting [www.nyc.gov/getcertified](http://www.nyc.gov/getcertified), emailing [MWBE@sbs.nyc.gov](mailto:MWBE@sbs.nyc.gov), or calling the DSBS certification helpline at (212) 513-6311.

The local collective bargaining agreements (CBAs) that are incorporated into the PLA as PLA Schedule A Agreements are available on computer disk from the Department's Contract Officer upon the request of any prospective bidder. Please note that the "PLA Schedule A" is distinct from the Department's Schedule A that is a part of this invitation for bids.

A contact list for the participating unions is set forth after the FAQs.

Below are answers to frequently asked questions (FAQs) about this PLA:

**Q1. Does a contractor need to be signatory with the unions in the NYC Building and Construction Trades Council in order to bid on projects under the PLA?**

A. No, any contractor may bid by signing and agreeing to the terms of the PLA. The contractor need not be signatory with these unions by any other labor agreement or for any other project.

**Q2. Does a contractor agreeing to the PLA and signing the Letter of Assent create a labor agreement with these unions outside of the project covered by the PLA?**

A. No, the PLA applies only to those projects that the Contractor agrees to perform under the PLA and makes no labor agreement beyond those projects.

**Q3. Does the PLA affect the subcontractors that a bidder may utilize on the project?**

A. Subject to the Department's approval of subcontractors pursuant to Article 17 of the Standard Construction Contract, a contractor may use any subcontractor, union or non-union, as long as the subcontractor signs and agrees to the terms of the PLA.

**Q4. Are bidders required to submit Letters of Assent signed by proposed subcontractors with their bid in order to be found responsive?**

A. No, bidders do not have to submit signed Letters of Assent from their subcontractors with their bid. Subcontractors, however, will be required to sign the letter of Assent prior to being approved by the Department.

**Q5. May a contractor or subcontractor use any of its existing employees to perform this work?**

A. Generally labor will be referred to the contractor from the respective signatory local unions. See PLA Article 4. However, contractors and subcontractors may continue to use up to 12% of their existing, qualifying labor force for this work, in accordance with the terms of PLA Article 4, Section 2B. Certified MWBEs for which participation goals are set pursuant to NYC Administrative Code §6-129 that are not signatory to any Schedule A CBAs may use their existing employees for the 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup> and 8<sup>th</sup> employee needed on the job if their contracts are valued at or under \$500,000. For contracts valued at above \$500,000 but under \$1,000,000, such certified MWBEs may use their own employees for the 2<sup>nd</sup>, 5<sup>th</sup> and 8<sup>th</sup> employees needed on the job in accordance with the provisions of PLA Article 4, Section 2C. If additional workers are needed by these MWBEs, the additional workers will be referred to the contractor from the signatory local unions subject to the contractor's right to meet 12% of the additional needs with its existing, qualifying employees.

**Q6. Must the City set MWBE participation goals for the particular project or contract in order for a certified MWBE to utilize the provisions of PLA Article 4, Section 2C?**

A. No. PLA Article 4, Section 2(C) specifies what categories of MWBEs are eligible to take advantage of this provision (i.e., those MWBEs for which the City is authorized to set participation goals under §6-129). For purposes of section 2(C), it is not necessary for the project to be subject to §6-129 or for the City to have actually set participation goals for the particular contract or project. The result is the same where a projects receives State funding and therefore is subject to the requirements of Article 15-A of the Executive Law.

**Q7. May a contractor bring in union members from locals that are not signatory unions?**

A. Referrals will be from the respective signatory locals and/or locals listed in schedule A of the PLA. Contractors may utilize 'traveler provisions' contained in the local collective bargaining agreements (local CBAs) where such provisions exist and/or in accordance with the provisions of PLA Article 4, Section 2.

**Q8. Does a non-union employee working under the PLA automatically become a union member?**

A. No, the non-union employee does not automatically become a union member by working on a project covered by the PLA. Non-union employees working under the PLA are subject to the union security provisions (i.e., union dues/agency shop fees) of the local CBAs while on the project. These employees will be enrolled in the appropriate benefit plans and earn credit toward various union benefit programs. See PLA Article 4, Section 6 and Article 11.

**Q9. Are all contractors and subcontractors working under the PLA, including non-union contractors and contractors signatory to collective bargaining agreements with locals other than those that are signatories to the PLA, required to make contributions to designated employee benefit funds?**

A. Contractors and subcontractors working under the PLA will be required to contribute on behalf of all employees covered by the PLA to established jointly trustee employee benefit funds designated in the Schedule A CBAs and required to be paid on public works under any applicable prevailing wage law. See PLA Article 11, Section 2. The Agency may withhold from amounts due the contractor any amounts required to be paid, but not actually paid into any such fund by the contractor or a subcontractor. See PLA Article 11, Section 2 C.

**Q10. What happens if a contractor or subcontractor fails to make a required payment to a designated employee benefit fund?**

A. The PLA sets forth a process for unions to address a contractor or a subcontractor's failure to make required payments. The process includes potentially the direct payment by the City to the benefit fund of monies owed and the corresponding withholding of payments to the Contractor. See PLA Article 11, Section 2. The City strongly advises Contractors to read these provisions carefully and to include appropriate provisions in subcontracts addressing these possibilities.

**Q11. Does signing on to the PLA satisfy the Apprenticeship Requirements established for this bid?**

A. Yes. By agreeing to perform the Work subject to the PLA, the bidder demonstrates compliance with the apprenticeship requirements imposed by this invitation for Bids.

**Q12. Does the PLA provide a standard work day across all the signatory trades?**

A. Yes, all signatory trades will work an eight (8) hour day, Monday through Friday with a day shift at straight time as the standard work week. The PLA also permits a contractor to schedule a four day [within Monday through Friday] work week, ten (10) hours per day at straight time if announced at the commencement of the project. See PLA Article 12, Section 1. This is an example where the terms of the PLA override provisions of the Standard Construction Contract (compare with section 37.2 of the Standard Construction Contract).

**Q13. Does the PLA create a common holiday schedule for all the signatory trades?**

A. Yes, the PLA recognizes eight (8) common holidays. See PLA Article 12, Section 4.

**Q14. Does the PLA provide for a standard policy for 'shift work' across all signatory trades?**

A. Yes, second and third shifts may be worked with a standard 5% premium pay. In addition, a day shift does not have to be scheduled in order to work the second and third shifts at the 1.05 hourly pay rate. See PLA Article 12, Section 3.

**Q15. May the Contractor schedule overtime work, including work on a weekend?**

A. Yes, the PLA permits the Contractor to schedule overtime work, including work on the weekends. See PLA Article 12, Sections 2, 3, and 5. To the extent that the Agency's approval is required before a Contractor may schedule or be paid for overtime, that approval is still required notwithstanding the PLA language.

**Q16. Are overtime payments affected by the PLA?**

A. Yes, all overtime pay incurred Monday through Saturday will be at time and one half (1 ½). There will be no stacking or pyramiding of overtime pay under any circumstances. See PLA Article 12, Section 2. Sunday and holiday overtime will be paid according to each trades CBA.

**Q17. Are there special provisions for Saturday work when a day is 'lost' during the week due to weather, power failure or other emergency?**

A. Yes, when this occurs the Contractor may schedule Saturday work at weekday rates. See PLA Article 12, Section 5.

**Q18. Does the PLA contain special provisions for the manning of Temporary Services?**

A. Yes. Where temporary services are required by specific request of the agency or construction manager, they shall be provided by the contractor's existing employees during working hours in which a shift is scheduled for employees of the contractor. The need for temporary services during non-working hours will be determined by the agency or construction manager. There will be no stacking of trades on temporary services. See PLA Article 15.

**Q19. What do the workers get paid when work is terminated early in a day due to inclement weather or otherwise cut short of 8 hours?**

A. The PLA provides that employees who report to work pursuant to regular schedule and not given work will be paid two hours of straight time. Work terminated early for severe weather or emergency conditions will be paid only for time actually worked. In other instances where work is terminated early, the worker will be paid for a full day. See PLA Article 12, Sections 6 and 8.

**Q20. Should a local collective bargaining agreement [local CBA] expire during the project will a work stoppage occur on a project subject to the PLA?**

A. No. All the signatory unions are bound by the 'no strike' agreement as to the PLA work. Work will continue under the PLA and the otherwise expired local CBA(s) until the new local CBA(s) are negotiated and in effect. See PLA Articles 7 and 19.

**Q21. May a contractor working under the PLA be subject to a strike or other boycott activity by a signatory union at another site while the contractor is a signatory to the PLA?**

A. Yes. The PLA applies ONLY to work under the PLA and does not regulate labor relations at other sites even if those sites are in close proximity to PLA work.

**Q22. If a contractor has worked under other PLAs in the New York City area, are the provisions in this PLA generally the same as the others?**

A. While Project Labor Agreements often look similar to each other, and particular clauses are often used in multiple agreements, each PLA is a unique document and should be examined accordingly.

**Q23. What happens if a dispute occurs between the contractor and an employee during the project?**

A. The PLA contains a grievance and arbitration process to resolve disputes between the contractor and the employees. See PLA Article 9.

**Q24. What happens if there is a dispute between locals as to which local gets to provide employees for a particular project or a particular aspect of a project?**

A. The PLA provides for jurisdictional disputes to be resolved in accordance with the NY Plan. See PLA Article 10. A copy of the NY Plan is available upon request from the Department. The PLA provides that work is not to be disrupted or interrupted pending the resolution of any jurisdictional dispute. The work proceeds as assigned by the contractor until the dispute is resolved. See PLA Article 10, Section 3.

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## CONTACT INFORMATION FOR LOCAL UNIONS

### **BOILER MAKERS LOCAL NO. 5**

24 Van Siclen Avenue  
Floral Park, NY 11001  
Phone: (516) 326-2500  
Fax: (516) 326-3435  
Thomas Klein, Bus. Mgr.  
[boilermakers5@optonline.net](mailto:boilermakers5@optonline.net)

### **BLASTERS & DRILLERS LOCAL NO. 29**

43-12 Ditmars Blvd.  
Astoria, NY, 11105  
Phone: (718) 278-5800  
Thomas Russo, bus mgr.

### **BRICKLAYERS LOCAL NO. 1**

Santo Lanzafame (718) 392-0525

### **BUILDING TRADES**

71 West 23<sup>rd</sup> Street, Suite 501  
New York, NY 10010  
Phone: (212) 647-0700  
Fax: (212) 647-0705  
John Barnett, Chairman

### **CARPENTERS DISTRICT COUNCIL**

395 Hudson Street  
New York, New York 10014  
Phone: (212) 366-7500  
Fax: (212) 675-3140  
Michael J. Forde, Executive Secy Treas.  
Peter Thomassen, President  
Denis Sheil, V.P.  
Ronald Rawald, D.C. Rep.  
[carpmik@aol.com](mailto:carpmik@aol.com)

### **CEMENT MASONS NO. 780**

150-42 12<sup>th</sup> Avenue  
Whitestone, NY 11357  
Phone: (718) 357-3750  
Fax: (718) 357-2057  
Angelo Scagnelli, Bus. Mgr.  
Paul M. Mantia, President  
[Angelolocal780@yahoo.com](mailto:Angelolocal780@yahoo.com)

### **CONCRETE WORKERS DISTRICT COUNCIL NO. 16**

29-18 35<sup>th</sup> Avenue  
Long Island City, NY 11106  
Phone: (718) 392-5077  
Fax: (718) 392-5087  
Alex Castaldi, Pres. Bus. Mgr.  
[Ccwdc16@yahoo.com](mailto:Ccwdc16@yahoo.com)

### **DERRICKMEN AND RIGGERS CONCRETE WORKERS**

25-19 43<sup>rd</sup> Avenue  
Long Island City, NY 11101  
Phone: (718) 361-6534

Fax: (718) 361-6584  
Joseph McDonald, Bus. Agent  
[joemac197@aol.com](mailto:joemac197@aol.com)

**DRYWALL TAPERS 1974**

265 West 14<sup>th</sup> Street  
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Ellior Santiago, Org.  
Vincent Calderone, Org.  
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[Local1974@aol.com](mailto:Local1974@aol.com)

**ELECTRICAL LOCAL NO. 3**

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Raymond Melville, Asst. Bus. Mgr. Construction  
Paul Ryan, Asst. Bus. Mgr. Westchester/Fairfield  
Luis Restrepo, Asst. Bus. Mgr.  
Mark G. Hansen, Bus. Rep.  
Elliot Hecht, Bus. Rep.  
Raymond Kitson, Bus. Rep.  
Austin McCann, Bus. Rep.  
Robert Olenick, Bus. Rep.  
Michael O'Neill, Bus. Rep.  
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Louis Sciara, Bus. Rep.  
Lance Van Arsdale, Asst. Bus. Maintenance Division  
Ray West, Bus. Rep.  
[mail@local3ibew.org](mailto:mail@local3ibew.org)

**ELEVATOR CONSTRUCTORS NO. 1**

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Fax: (718) 767-6730  
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Thomas Moore, Bus. Agent  
Gary Riefenhauser, Bus. Agent  
Fred McCourt, Bus. Agent  
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[llegotte@localoneiuec.com](mailto:llegotte@localoneiuec.com)  
[snoble@localoneiuec.com](mailto:snoble@localoneiuec.com)

**ENGINEERS NO. ENGINEERS LOCAL UNION NO. 14**

141-57 Northern Boulevard  
Flushing, NY 11354  
Phone: (718) 939-0600  
Fax: (718) 939-3131  
Edwin Christian, Pres. Bus. Mgr.



Christopher Confrey, Bus. Rep. Rec Sec.  
John R. Powers, Bus. Rep. Treas.  
[engineers@iuoelocal14.com](mailto:engineers@iuoelocal14.com)

**ENGINEERS NO. 15, 15A, 15B, 15C, 15D**

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Charles Gambino, Bus. Rep., Fin. Sec.  
Brian S. Kelly, Bus. Rep. & Rec. Sec.  
Daniel Schneider, Bus. Rep. & Treasurer  
Gregg Nolan, Bus. Rep.  
Christopher Thomas, Bus. Rep.  
Bruce Murphy, Director of Training

**ENGINEERS NO. 30**

115-06 Myrtle Avenue  
Richmond Hill, NY 11418  
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Fax: (718) 850-0524  
John T. Ahern, Bus. Mgr.

**ENGINEERS No. 94**

331-337 West 44<sup>th</sup> Street  
New York, NY 10036  
Phone: (212) 245-7040 Fax: (212) 245-7886  
Kuba Brown, Bus. Mgr. & President  
[kubabrown@local94.com](mailto:kubabrown@local94.com)

**GLAZERS NO. 1281**

45 West 14<sup>th</sup> Street  
New York, NY 10011  
Phone: (212) 924-5200  
Fax: (212) 255-1151  
William Elfeld, Bus. Rep.

**HEAT & FROST INSULATORS AND ASBESTOS WORKERS LOCAL UNION NO. 12**

25-19 43<sup>rd</sup> Avenue  
Long Island City, NY 11101  
Phone: (718) 784-3456  
Fax: (718) 784-8357  
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Matthew Aracick, Fin. Sec.  
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Dennis Ippolito, Bus. Mgr.  
[matty@insulatorslocal12.com](mailto:matty@insulatorslocal12.com)  
[dennis@insulators.org](mailto:dennis@insulators.org)

**HEAT FROST INSULATORS LOCAL UNION NO. 12A**

2110 Newton Avenue  
Astoria, NY 11102  
Phone: (718) 937-3203  
Fax: (718) 482-8722  
Francisco Vega, Bus. Mgr.

**IRON WORKERS DISTRICT**

505 White Plains Road, Suite 200  
Tarrytown, NY 10591  
Phone: (914) 332-4430  
Fax: (914) 332-4431  
Edward J. Walsh, Pres.  
[ironworkdc@aol.com](mailto:ironworkdc@aol.com)

**IRON WORKERS NO. 40**

451 Park Avenue South  
New York, NY 10016  
Phone: (212) 889-1320  
Fax: (212) 779-3267  
Robert Walsh, Bus. Mgr. Fin. Sec.  
Daniel Doyle, Bus. Rep. V.P.  
Kevin O'Rourke, Pres. Bus. Agent

**IRON WORKERS NO. 361**

89-19 97<sup>TH</sup> Avenue  
Ozone Park, NY 11416  
Phone: (718) 332-1016-17  
Fax: (718) 322-1053  
Matthew Chartrand, Pres. Bus. Agent  
Richard O'Kane, Bus. Mgr. Fin. Sec.  
Thomas Seaman, President  
Anthony DeBlaisie, Bus. Agent, V.P.  
John Delaney, Jr., Rec. Sec.  
[unionhall@361.com](mailto:unionhall@361.com)

**LABORERS LOCAL NO. 78 ASBESTOS & LEAD ABATEMENT**

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New York, New York 10038-2825  
Phone: (212) 227-4805  
Fax: (212) 406-1800  
Kazik Prosniewski, Pres.  
Edison Severino, Bus. Mgr.  
Pawel Gruchacz, Sec. Treas.  
[Local78dispatchers@gmail.com](mailto:Local78dispatchers@gmail.com)

**LABORERS, CONSTRUCTION AND GENERAL BUILDING NO. 79**

520 8<sup>th</sup> Avenue  
New York, NY 10018  
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George Zecca, Bus. Mgr.  
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Chas Rynkiewicz, Organizer, Mk Dev.  
Eugene Sparano, Organizer Mkt. Dev.  
John Modica, Bus. Agent  
Joseph Cangelosi, Bus. Agent  
Kenny Robinson, Bus. Agent  
James Haggerty, Bus. Agent  
Carl Tully, Bus. Agent  
Jose Andino, Bus. Agent  
Edward Medina, Bus. Agent

Luis Pereria, Bus Agent  
Noe Duran, Bus. Agent  
Timothy Campbell, Bus. Agent  
John Wund, Agent, Organizer  
[79@laborerslocal.org](mailto:79@laborerslocal.org)

**LABORERS NO. 731**

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Joseph D'Amato, Bus. Mgr.

**LATHERS METAL LOCAL NO. 46**

1322 Third Avenue  
New York, NY 10021  
Phone: (212) 737-0500  
Fax: (212) 249-1226  
Robert Ledwith, Bus. Mgr.  
Terence Moore, Bus. Agent  
Kenneth Allen, Bus. Agent  
Fred LeMoine Jr., Bus. Agent  
Kevin Kelly, Bus. Agent

**MASON TENDERS DIST. COUNCIL**

520 8<sup>th</sup> Avenue  
New York, NY 10018  
Phone: (212) 452-9400  
Fax: (212) 452-9499  
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David Bolger, Field Rep.

**METAL POLISHERS LOCAL UNION NO. 8A**

36-18 33<sup>rd</sup> Street 2<sup>nd</sup> Fl.  
Long Island City, 11106  
Phone: (718) 361-1770  
Fax: (718) 361-1934  
Hector Lopez, Bus. Mgr., Pres.

**METAL TRADES DIVISION**

Kevin Connelly, Bus. Agent  
21-42 44<sup>th</sup> Drive

**MILLWRIGHT AND MACHINERY ERECTORS LOCAL NO. 740**

89-07 Atlantic Avenue  
Woodhavaen, NY 11412  
Phone: (71) 849-3636  
Fax: (718) 849-0070  
Robert Seeger, Bus. Mgr.

**ORNAMENTAL IRON WORKERS NO. 580**

501 West 42<sup>nd</sup> Street  
New York, NY 10036  
Phone: (212) 594-1662  
Fax: (212) 564-2748  
Dennis Lusardi, Bus. Mgr.  
James Mahoney, Bus. Agent  
Robert Benesh, Bus. Agent  
Dennis Milton, Bus. Agent

Peter Creegan, Bus. Agent  
[dlusardi@local-580.com](mailto:dlusardi@local-580.com)

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Greg Coords, Bus. Rep.  
Richard Small, Bus. Rep.  
Jose Torent, Bus. Rep.  
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Paul Belliveau, Bus. Rep.  
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**PROJECT LABOR AGREEMENT**  
**COVERING**  
**NEW CONSTRUCTION OF IDENTIFIED**  
**CITY OWNED BUILDINGS AND STRUCTURES**

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**PROJECT LABOR AGREEMENT COVERING SPECIFIED  
RENOVATION & REHABILITATION OF NEW YORK CITY OWNED  
FACILITIES & STRUCTURES**

**ARTICLE 1 - PREAMBLE**

WHEREAS, the City of New York, acting through the Department of Sanitation, desires to provide for the cost efficient, safe, quality, and timely completion of certain new construction ("Program Work," as defined in Article 3) in a manner designed to afford the lowest costs to the Agency and the Public it represents, and the advancement of permissible statutory objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

(1) providing a mechanism for responding to the unique construction needs associated with this Program Work and achieving the most cost effective means of construction, including direct labor cost savings, by the Building and Construction Trades Council of Greater New York and Vicinity and the signatory Local Unions and their members waiving various shift and other hourly premiums and other work and pay practices which would otherwise apply to Program Work;

(2) expediting the construction process and otherwise minimizing the disruption to the covered Agency's ongoing operations at the facilities that are the subject of the Agreement;

(3) avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes, reducing jobsite friction on common situs worksites, and promoting labor harmony and peace for the duration of the Program Work;

(4) standardizing the terms and conditions governing the employment of labor on the Program Work;

(5) permitting wide flexibility in work scheduling and shift hours and times to allow maximum work to be done during off hours yet at affordable pay rates;

(6) permitting adjustments to work rules and staffing requirements from those which otherwise might obtain;

(7) providing comprehensive and standardized mechanisms for the settlement

Execution Version

of work disputes, including those relating to jurisdiction;

- (8) ensuring a reliable source of skilled and experienced labor; and
- (9) securing applicable New York State Labor Law exemptions.

WHEREAS, the Building and Construction Trades Council of Greater New York and Vicinity, its participating affiliated Local Unions and their members, desire to assist the City in meeting these operational needs and objectives as well as to provide for stability, security and work opportunities which are afforded by this Project Labor Agreement; and

WHEREAS, the Parties desire to maximize Program Work safety conditions for both workers and the community in the project area.

NOW, THEREFORE, the Parties enter into this Agreement:

## **SECTION 1. PARTIES TO THE AGREEMENT**

This is a Project Labor Agreement ("Agreement") entered into by the New York City Department of Sanitation, including in its capacity as construction manager of covered projects and/or on behalf of any third party construction manager which may be utilized, and the Building and Construction Trades Council of Greater New York and Vicinity ("Council") (on behalf of itself) and the signatory affiliated Local Union's ("Unions" or "Local Unions"). The Council and each signatory Local Union hereby warrants and represents that it has been duly authorized to enter into this Agreement.

## **ARTICLE 2 - GENERAL CONDITIONS**

### **SECTION 1. DEFINITIONS**

Throughout this Agreement, the various Union parties including the Building and Construction Trades Council of Greater New York and Vicinity and its participating affiliated Local Unions, are referred to singularly and collectively as "Union(s)" or "Local Unions"; the

term "Contractor(s)" shall include any Construction Manager, General Contractor and all other contractors, and subcontractors of all tiers engaged in Program Work within the scope of this Agreement as defined in Article 3; "Agency" means the New York City Department of Sanitation (DSNY); when the Agency acts as Construction Manager, unless otherwise provided, it has the rights and obligations of a "Construction Manager" in addition to the rights and obligations of the Agency; the Building and Construction Trades Council of Greater New York and Vicinity is referred to as the "Council"; and the work covered by this Agreement (as defined in Article 3) is referred to as "Program Work."

## **SECTION 2. CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE**

This Agreement shall not become effective unless each of the following conditions are met: the Agreement is executed by (1) the Council, on behalf of itself, (2) the participating affiliated Local Unions; and (3) the commissioner of the Agency or his designee.

## **SECTION 3. ENTITIES BOUND & ADMINISTRATION OF AGREEMENT**

This Agreement shall be binding on all participating Unions and their affiliates, the Construction Manager (in its capacity as such) and all Contractors of all tiers performing Program Work, as defined in Article 3. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement a requirement that their subcontractors, of all tiers, become signatory and bound by this Agreement with respect to that subcontracted work falling within the scope of Article 3 and all Contractors (including subcontractors) performing Program Work shall be required to sign a "Letter of Assent" in the form annexed hereto as Exhibit "A". This Agreement shall be administered by the Agency or a Construction Manager or such other designee as may be named by the Agency or Construction Manager, on behalf of all Contractors.

## **SECTION 4. SUPREMACY CLAUSE**

This Agreement, together with the local Collective Bargaining Agreements appended hereto as Schedule A, represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other collective bargaining agreement of any type which would otherwise apply to this Program Work, in whole or in part, except that Program Work which falls within the jurisdiction of the Operating Engineers Locals 14 and 15 and/or the Teamsters Local 282 will be performed under the terms and conditions set out in the Schedule A agreements of Operating Engineers Locals 14 and 15 and Teamsters Local 282. Subject to the foregoing, where a subject covered by the provisions of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall prevail. It is further understood that no Contractor shall be required to sign any other agreement as a condition of performing Program Work. No practice, understanding or agreement between a Contractor and a Local Union which is not set forth in this Agreement shall be binding on this Program Work unless endorsed in writing by the Construction Manager or such other designee as may be designated by the Agency.

#### **SECTION 5. LIABILITY**

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Construction Manager and any Contractor shall not be liable for any violations of this Agreement by any other Contractor; and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Union.

#### **SECTION 6. THE AGENCY**

The Agency (or Construction Manager where applicable) shall require in its bid specifications for all Program Work within the scope of Article 3 that all successful bidders, and their subcontractors of all tiers, become bound by, and signatory to, this Agreement. The

Agency (or Construction Manager) shall not be liable for any violation of this Agreement by any Contractor. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the Agency or Construction Manager in determining which Contractors shall be awarded contracts for Program Work. It is further understood that the Agency or Construction Manager has sole discretion at any time to terminate, delay or suspend the Program Work, in whole or part, on any Program.

#### **SECTION 7. AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS**

The Unions agree that this Agreement will be made available to, and will fully apply to, any successful bidder for (or subcontractor of) Program Work who becomes signatory thereto, without regard to whether that successful bidder (or subcontractor) performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder (or subcontractor) are, or are not, members of any unions. This Agreement shall not apply to the work of any Contractor which is performed at any location other than the site of Program Work.

#### **SECTION 8. SUBCONTRACTING**

Contractors will subcontract Program Work only to a person, firm or corporation who is or agrees to become party to this Agreement.

#### **ARTICLE 3-SCOPE OF THE AGREEMENT**

##### **SECTION 1. WORK COVERED**

Program Work shall be limited to construction contracts bid and let by the Agency (or its Construction Manager where applicable) after the effective date of this Agreement (and prior to June 30, 2014) for that new construction on the following projects:



1. East 91st Street Marine Transfer Station, East River and 91st Street, Manhattan;
2. Southwest Brooklyn Marine Transfer Station, Gravesend Bay waterfront, Bensonhurst, Brooklyn; and
3. Manhattan 1/2/5 Garage, 500 Washington Street, Manhattan.

It is understood that Program Work does not include, and this Project Labor Agreement shall not apply to, any other work, including:

1. Contracts let and work performed in connection with projects carried over, recycled from, or performed under bids or rebids relating to work that were bid prior to the effective date of this Agreement or after June 30, 2014;
2. Contracts procured on an emergency basis;
3. Small purchases (purchases not more than \$100,000) awarded pursuant to New York City Charter §314, New York City Charter § 316 and New York City Procurement Policy Board Rules §3-08;
4. Contracts with electric utilities, gas utilities, telephone companies, and railroads, except that it is understood and agreed that these entities may only install their work to a demarcation point, e.g. a telephone closet or utility vault, the location of which is determined prior to construction and employees of such entities shall not be used to replace employees performing Program Work pursuant to this agreement; and
5. Contracts for installation of information technology that are not otherwise Program Work.

## SECTION 2. TIME LIMITATIONS

In addition to falling within the scope of Article 3, Section 1, to be covered by this

Agreement Program Work must be (1) advertised and let for bid after the effective date of this Agreement, and (2) let for bid prior to June 30, 2014, the expiration date of this Agreement. It is understood that this Agreement, together with all of its provisions, shall remain in effect for all such Program Work until completion, even if not completed by the expiration date of the Agreement. If Program Work otherwise falling within the scope of Article 3, Section 1 is not let for bid by the expiration date of this Agreement, this Agreement may be extended to that work by mutual agreement of the parties.

### **SECTION 3. EXCLUDED EMPLOYEES**

The following persons are not subject to the provisions of this Agreement, even though performing Program Work:

A. Superintendents, supervisors (excluding general and forepersons specifically covered by a craft's Schedule A), engineers, professional engineers and/or licensed architects engaged in inspection and testing, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, technicians, non-manual employees, and all professional, engineering, administrative and management persons;

B. Employees of the Agency, New York City, or any other municipal or State agency, authority or entity, or employees of any other public employer, even though working on the Program site while covered Program Work is underway;

C. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery or involved in deliveries to and from the Program site, except to the extent they are lawfully included in the bargaining unit of a Schedule A agreement;

D. Employees of the Construction Manager (except that in the event the

Agency engages a Contractor to serve as Construction Manager, then those employees of the Construction Manager performing manual, on site construction labor will be covered by this Agreement);

E. Employees engaged in on-site equipment warranty work unless employees are already working on the site and are certified to perform warranty work;

F. Employees engaged in geophysical testing other than boring for core samples;

G. Employees engaged in laboratory, specialty testing, or inspections, pursuant to a professional services agreement between the Agency, or any of the Agency's other professional consultants, and such laboratory, testing, inspection or surveying firm; and

H. Employees engaged in on-site maintenance of installed equipment or systems which maintenance is awarded as part of a contract that includes Program Work but which maintenance occurs after installation of such equipment or system and is not directly related to construction services.

#### **SECTION 4. NON-APPLICATION TO CERTAIN ENTITIES**

This Agreement shall not apply to those parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractor which do not perform Program Work. It is agreed that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the Agency (including in its capacity as Construction Manager) or any Contractor. The Agreement shall further not apply to any New York City or other municipal or State agency, authority, or entity other than the Agency and nothing contained herein shall be construed to prohibit or restrict the Agency or its employees, or any State, New York City or other municipal or State authority, agency or entity and its employees, from performing on or

off-site work related to Program Work.

As the contracts involving Program Work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty work are assigned in writing (copy to Local Union involved) by the Agency (or Construction Manager) for performance under the terms of this Agreement.

#### **ARTICLE 4- UNION RECOGNITION AND EMPLOYMENT**

##### **SECTION 1. PRE-HIRE RECOGNITION**

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all employees who are performing on-site Program Work, with respect to that work.

##### **SECTION 2. UNION REFERRAL**

A. The Contractors agree to employ and hire craft employees for Program Work covered by this Agreement through the job referral systems and hiring halls established in the Local Unions area collective bargaining agreements. Notwithstanding this, Contractors shall have sole right to determine the competency of all referrals; to determine the number of employees required; to select employees for layoff (subject to Article 5, Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments. In the event that a Local Union is unable to fill any request for qualified employees within a 48 hour period after such requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article.

The Contractor shall notify the Local Union of craft employees hired for Program Work within its jurisdiction from any source other than referral by the Union.

B. A Contractor may request by name, and the Local will honor, referral of persons who have applied to the Local for Program Work and who meet the following qualifications:

- (1) possess any license required by New York State law for the Program Work to be performed;
- (2) have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and
- (3) were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award.

No more than twelve per centum (12%) of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above. Under this provision, name referrals begin with the eighth employee needed and continue on that same basis.

C. Notwithstanding Section 2(B), above, certified MWBE contractors for which participation goals are set pursuant to New York City Administrative Code §6-129, that are not signatory to any Schedule A CBAs, with contracts valued at or under five hundred thousand (\$500,000), may request by name, and the Local will honor, referral of the second (2<sup>nd</sup>), fourth (4<sup>th</sup>), sixth (6<sup>th</sup>), and eighth (8<sup>th</sup>) employee, who have applied to the Local for Program Work and who meet the following qualifications:

- (1) possess any license required by New York State law for the Program Work to be performed;
- (2) have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and

- (3) were on the Contractor's active payroll for at least 60 out of the 180 work days prior to the contract award.

For such contracts valued at above \$500,000 but less than \$1 million, the Local will honor referrals by name of the second (2<sup>nd</sup>), fifth (5<sup>th</sup>), and eighth (8<sup>th</sup>) employee subject to the foregoing requirements. In both cases, name referrals will thereafter be in accordance with Section 2(B), above.

D. Where a certified MWBE Contractor voluntarily enters into a Collective Bargaining Agreement ("CBA") with a BCTC Union, the employees of such Contractor at the time the CBA is executed shall be allowed to join the Union for the applicable trade subject to satisfying the Union's basic standards of proficiency for admission.

### **SECTION 3. NON-DISCRIMINATION IN REFERRALS**

The Council represents that each Local Union hiring hall and referral system will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

### **SECTION 4: MINORITY AND FEMALE REFERRALS**

In the event a Local Union either fails, or is unable to refer qualified minority or female applicants in percentages equaling the workforce participation goals adopted by the City and set forth in the Agency's (or, if applicable, Construction Manager's) bid specifications, within 48 hours of the request for same, the Contractor may employ qualified minority or female

applicants from any other available source.

#### **SECTION 5. CROSS AND QUALIFIED REFERRALS**

The Local Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fulfill the requirements of the Contractor.

#### **SECTION 6. UNION DUES**

All employees covered by this Agreement shall be subject to the union security provisions contained in the applicable Schedule A local agreements, as amended from time to time, but only for the period of time during which they are performing on-site Program Work and only to the extent of tendering payment of the applicable union dues and assessments uniformly required for union membership in the Local Unions which represent the craft in which the employee is performing Program Work. No employee shall be discriminated against at any Program Work site because of the employee's union membership or lack thereof. In the case of unaffiliated employees, the dues payment will be received by the Local Unions as an agency shop fee.

#### **SECTION 7. CRAFT FOREPERSONS AND GENERAL FOREPERSONS**

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule A, and provided that all craft forepersons shall be experienced and qualified journeypersons in their trade as determined by the appropriate Local Union. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft forepersons shall be designated as working forepersons at the

request of the Contractor, except when an existing local Collective Bargaining Agreement prohibits a foreperson from working when the craft persons he is leading exceed a specified number.

## **ARTICLE 5- UNION REPRESENTATION**

### **SECTION 1. LOCAL UNION REPRESENTATIVE**

Each Local Union representing on-site employees shall be entitled to designate in writing (copy to Contractor involved and Construction Manager) one representative, and/or the Business Manager, who shall be afforded access to the Program Work site.

### **SECTION 2. STEWARDS**

A. Each Local Union shall have the right to designate a working journey person as a Steward and an alternate, and shall notify the Contractor and Construction Manager of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. All Stewards shall be working Stewards.

B. In addition to their work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's trade and, if applicable, subcontractors of their Contractor, but not with the employees of any other trade Contractor. No Contractor shall discriminate against the Steward in the proper performance of Union duties.

C. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a Schedule A provision providing procedures for the equitable distribution of overtime.



### **SECTION 3. LAYOFF OF A STEWARD**

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A provision, such provision shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

## **ARTICLE 6- MANAGEMENT'S RIGHTS**

### **SECTION 1. RESERVATION OF RIGHTS**

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to, the right to: direct the work force, including determination as to the number of employees to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; require compliance with the directives of the Agency including standard restrictions related to security and access to the site that are equally applicable to Agency employees, guests, or vendors; or the discipline or discharge for just cause of its employees; assign and schedule work; promulgate reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, Agency and/or Construction Manager and/or joint working efforts with other employees shall be permitted or observed.

### **SECTION 2. MATERIALS, METHODS & EQUIPMENT**

There shall be no limitation or restriction upon the Contractors' choice of

materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source; provided, however, that where there is a Schedule "A" that includes a lawful union standards and practices clauses, then such clause as set forth in Schedule A Agreements will be complied with, unless there is a lawful Agency specification (or specification issued by a Construction Manager which would be lawful if issued by the Agency directly) that would specifically limit or restrict the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices, and which would prevent compliance with such Schedule A clause. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is performed off-site for Program Work.

## **ARTICLE 7- WORK STOPPAGES AND LOCKOUTS**

### **SECTION 1. NO STRIKES-NO LOCK OUT**

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Program Work site for any reason by any Union or employee against any Contractor or employer. There shall be no

other Union, or concerted or employee activity which disrupts or interferes with the operation of the Program Work or the objectives of the Agency at any Program Work site. In addition, failure of any Union or employee to cross any picket line established by any Union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to a Program Work site where the failure to cross disrupts or interferes with the operation of Program Work is a violation of this Article. Should any employees breach this provision, the Unions will use their best efforts to try to immediately end that breach and return all employees to work. There shall be no lockout at a Program Work site by any signatory Contractor, Agency or Construction Manager.

## **SECTION 2. DISCHARGE FOR VIOLATION**

A Contractor may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

## **SECTION 3. NOTIFICATION**

If a Contractor contends that any Union has violated this Article, it will notify the Local Union involved advising of such fact, with copies of the notification to the Council. The Local Union shall instruct and order, the Council shall request, and each shall otherwise use their best efforts to cause, the employees (and where necessary the Council shall use its best efforts to cause the Local Union), to immediately cease and desist from any violation of this Article. If the Council complies with these obligations it shall not be liable for the unauthorized acts of a Local Union or its members. Similarly, a Local Union and its members will not be liable for any unauthorized acts of the Council. Failure of a Contractor or the Construction Manager to give any notification set forth in this Article shall not excuse any violation of Section 1 of this Article.

#### SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

A. A party invoking this procedure shall notify J.J. Pierson or Richard Adelman who shall alternate (beginning with Arbitrator J.J. Pierson) as Arbitrator under this expedited arbitration procedure. If the Arbitrator next on the list is not available to hear the matter within 24 hours of notice, the next Arbitrator on the list shall be called. Copies of such notification will be simultaneously sent to the alleged violator and Council.

B. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, the Council and the Construction Manager, hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice required by Section 3, above.

C. All notices pursuant to this Article may be provided by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the Arbitrator, Contractor, Construction Manager and Local Union involved. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and

Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (any damages issue is reserved solely for court proceedings, if any.) The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

E. The Agency and Construction Manager (or such other designee of the Agency) may participate in full in all proceedings under this Article.

F. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved, and the Construction Manager.

G. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

H. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

#### **SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION**

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the

discipline imposed where a violation is found to have occurred.

## **ARTICLE 8 - LABOR MANAGEMENT COMMITTEE**

### **SECTION 1. SUBJECTS**

The Program Labor Management Committee will meet on a regular basis to: 1) promote harmonious relations among the Contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interests; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; and 5) review efforts to meet applicable participation goals for MWBEs and workforce participation goals for minority and female employees.

### **SECTION 2. COMPOSITION**

The Committee shall be jointly chaired by a designee of the Agency and the President of the Council. It may include representatives of the Local Unions and Contractors involved in the issues being discussed. The parties may mutually designate an MWBE representative to participate in appropriate Committee discussions. The Committee may conduct business through mutually agreed upon sub-committees.

## **ARTICLE 9- GRIEVANCE & ARBITRATION PROCEDURE**

### **SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES**

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below, provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

#### **Step 1:**

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor and the Construction Manager. To be timely, such notice of the grievance must be given within 7 calendar days after the act, occurrence or event giving rise to the grievance. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 7 calendar days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Construction Manager (or designee) as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

**Step 2:**

The Business Manager or designee of the involved Local Union, together with representatives of the involved Contractor, Council and the Construction Manager (or designee),

shall meet in Step 2 within 7 calendar days of service of the written grievance to arrive at a satisfactory settlement.

**Step 3:**

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants, including the Construction Manager or designee) to J.J. Pierson or Richard Adelman, who shall act, alternately (beginning with Arbitrator J.J. Pierson), as the Arbitrator under this procedure. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Construction Manager (or designee), involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

**SECTION 2. LIMITATION AS TO RETROACTIVITY**

No arbitration decision or award may provide retroactivity of any kind exceeding 60 calendar days prior to the date of service of the written grievance on the Construction Manager and the involved Contractor or Local Union.

**SECTION 3. PARTICIPATION BY AGENCY AND/OR CONSTRUCTION MANAGER**



The Agency and Construction Manager (or such other designee of the Agency) shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these Steps, including Step 3 arbitration.

## **ARTICLE 10 - JURISDICTIONAL DISPUTES**

### **SECTION 1. NO DISRUPTIONS**

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

### **SECTION 2. ASSIGNMENT**

All Program Work assignments shall be made by the Contractor to unions affiliated with the BCTC consistent with the New York Plan for the Settlement of Jurisdictional Disputes ("New York Plan") and its Greenbook decisions, if any. Where there are no applicable Greenbook decisions, assignments shall be made in accordance with the provisions of the New York Plan and local industry practice.

### **SECTION 3. NO INTERFERENCE WITH WORK**

There shall be no interference or interruption of any kind with the Program Work while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award.

## **ARTICLE 11 - WAGES AND BENEFITS**

### **SECTION 1. CLASSIFICATION AND BASE HOURLY RATE**

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the hourly wage rates applicable for those classifications as required by the applicable prevailing wage laws.

## **SECTION 2. EMPLOYEE BENEFITS**

A. The Contractors agree to pay on a timely basis contributions on behalf of all employees covered by this Agreement to those established jointly trustee employee benefit funds designated in Schedule A (in the appropriate Schedule A amounts), provided that such benefits are required to be paid on public works under any applicable prevailing wage law. Bona fide jointly trustee fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly required under applicable prevailing wage law. Contractors, not otherwise contractually bound to do so, shall not be required to contribute to benefits, trusts or plans of any kind which are not required by the prevailing wage law provided, however, that this provision does not relieve Contractors signatory to local collective bargaining agreement with any affiliated union from complying with the fringe benefit requirements for all funds contained in the CBA.

B. The Contractors agree to be bound by the written terms of the legally established jointly trustee Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to Program Work done under this Agreement and only for those employees to whom this Agreement requires such benefit payments.

C. To the extent consistent with New York City's Procurement Policy Board Rules with respect to prompt payment, as published at [www.nyc.gov/ppb](http://www.nyc.gov/ppb), §4-06(e), and in consideration of the unions' waiver of their rights to withhold labor from a contractor or

subcontractor delinquent in the payment of fringe benefits contributions ("Delinquent Contractor"); the Agency agrees that where any such union and/or fringe benefit fund shall notify the Agency, the General Contractor, and the Delinquent Contractor in writing with back-up documentation that the Delinquent Contractor has failed to make fringe benefit contributions to it as provided herein and the Delinquent Contractor shall fail, within ten (10) calendar days after receipt of such notice, to furnish either proof of such payment or notice that the amount claimed by the union and/or fringe benefit fund is in dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor which the union or fringe benefit fund claims to be due it, and shall remit the amount when and so withheld to the fringe benefit fund and deduct such payment from the amounts then otherwise due and payable to the General Contractor, which payment shall, as between the General Contractor and the Agency, be deemed a payment by the Agency to the General Contractor; provided however, that in any month, such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. The union or its employee benefit funds shall include in its notification of delinquent payment of fringe benefits only such amount it asserts the Delinquent Contractor failed to pay on the specific project against which the claim is made and the union or its employee benefit funds may not include in such notification any amount such Delinquent Contractor may have failed to pay on any other City or non-City project.

D. In the event the General Contractor or Delinquent Contractor shall notify the Agency as above provided that the claim of the union or fringe benefit fund is in dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General

Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor which the union and/or fringe benefit fund claims to be due it, and deposit such amount when and so withheld in a separate interest-bearing account pending resolution of the dispute pursuant to the union's Schedule A agreement, and the amount so deposited together with the interest thereon shall be paid to the party or parties ultimately determined to be entitled thereto, or held until the Delinquent Contractor and union or fringe benefit fund shall otherwise agree as to the disposition thereof; provided however, that such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. In the event the Agency shall be required to withhold amounts from a General Contractor for the benefit of more than one fringe benefit fund, the amounts so withheld in the manner and amount prescribed above shall be applied to or for such fund in the order in which the written notices of nonpayment have been received by the Agency, and if more than one such notice was received on the same day, proportionately based upon the amount of the union and/or fringe benefit fund claims received on such day. Nothing herein contained shall prevent the Agency from commencing an interpleader action to determine entitlement to a disputed payment in accordance with section one thousand six of the civil practice law and rules or any successor provision thereto.

E. Payment to a fringe benefit fund under this provision shall not relieve the General Contractor or Delinquent Contractor from responsibility for the work covered by the payment. Except as otherwise provided, nothing contained herein shall create any obligation on the part of the Agency to pay any union or fringe benefit fund, nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed, between the

union/fund and/or fringe benefit and the Agency.

## **ARTICLE 12- HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS**

### **SECTION 1. WORK WEEK AND WORK DAY**

A. The standard work week shall consist of 40 hours of work at straight time rates, Monday through Friday, 8 hours per day, plus ½ hour unpaid lunch period.

B. In accordance with Program needs, there shall be flexible start times with advance notice from Contractor to the Union. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 5:30 p.m. The Evening Shift shall commence between the hours of 3:00 p.m. and 6:00 p.m., unless different times are necessitated by the Agency's phasing plans on specific projects. The Night Shift shall commence between the hours of 11:00 p.m. and 2:00 a.m., unless different times are necessitated by the Agency's phasing plans on specific projects. Subject to the foregoing, starting and quitting times shall occur at the Program Work site designated by the Contractor.

C. Scheduling - Monday through Friday is the standard work week; 8 hours of work plus ½ hour unpaid lunch.

D. Notice - Contractors shall provide not less than 5 days prior notice to the Local Union involved as to the work week and work hour schedules to be worked or such lesser notice as may be mutually agreed upon.

### **SECTION 2. OVERTIME**

Overtime shall be paid for any work over eight (8) hours in a day and over forty (40) hours in a week, at time and one half (1½) Monday through Saturday. All overtime work performed on Sunday and Holidays will be paid pursuant to the applicable Schedule A. There shall be no stacking or pyramiding of overtime pay under any circumstances. There will be no

restriction upon the Contractor's scheduling of overtime or the nondiscriminatory designation of employees who shall be worked, including the use of employees, other than those who have worked the regular or scheduled work week, at straight time rates. The Contractor shall have the right to schedule work so as to minimize overtime or schedule overtime as to some, but not all, of the crafts and whether or not of a continuous nature.

### SECTION 3. SHIFTS

A. Flexible Schedules - Scheduling of shift work, including Saturday and Sunday work, shall be within the discretion of the Contractor in order to meet Program Work schedules and existing Program Work conditions including the minimization of interference with the mission of the Agency. It is not necessary to work a day shift in order to schedule a second or third shift, or a second shift in order to schedule a third shift, or to schedule all of the crafts when only certain crafts or employees are needed. Shifts must have prior approval of the Agency or Construction Manager, and must be scheduled with not less than five work days notice to the Local Union or such lesser notice as may be mutually agreed upon.

B. Second and/or Third Shifts/Saturday and/or Sunday Work - - The second shift shall start between 3 p.m. and 6 p.m. and the third shift shall start between 11 p.m. and 2 a.m., subject to different times necessitated by the Agency phasing plans on specific projects. There shall be no reduction in shift hour work.

C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Program Work requirements subject to the notice requirements of paragraph A.

### SECTION 4. HOLIDAYS

A. Schedule - There shall be 8 recognized holidays on the Project:

New Years Day	Labor Day
Martin Luther King Day	President's Day
Memorial Day	Thanksgiving Day
Independence Day	Christmas Day

All said holidays shall be observed on the calendar date except those holidays which occur on Saturday shall be observed on the previous Friday and those that occur on Sunday shall be observed on the following Monday.

B. Payment - Regular holiday pay, if any, for work performed on such a recognized holiday shall be in accordance with the applicable Schedule A.

C. Exclusivity - No holidays other than those listed in Section 4(A) above shall be recognized or observed.

#### **SECTION 5. SATURDAY WORK**

The Contractor may schedule a Saturday work day and such time shall be scheduled and paid at time and one-half (1½) unless the applicable Schedule A permits a straight time rate.

#### **SECTION 6. REPORTING PAY**

A. Employees who report to the work location pursuant to their regular schedule and who are not provided with work shall be paid two hours reporting pay at straight time rates. An employee whose work is terminated early by a Contractor due to severe weather, power failure, fire or natural disaster or for similar circumstances beyond the Contractor's control, shall receive pay only for such time as is actually worked. In other instances in which an employee's work is terminated early (unless provided otherwise elsewhere in this Agreement),

the employee shall be paid for his full shift.

B. ~~When an employee, who has completed their scheduled shift and left the~~ Program Work site, is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive overtime pay at the rate of time and one-half of the employee's straight time rate for hours actually worked.

C. When an employee leaves the job or work location of their own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, they shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article there shall be no premiums, bonuses, hazardous duty, high time or other special premium payments or reduction in shift hours of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Article and except where an applicable Schedule A requires a full weeks' pay for forepersons.

#### **SECTION 7. PAYMENT OF WAGES**

A. Termination- Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of lay off or discharge.

#### **SECTION 8. EMERGENCY WORK SUSPENSION**

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of Program Work. In such instances, employees will be paid for actual time worked, except that when a Contractor requests that employees remain at the job site available for work, employees will be paid for that time at their hourly rate



of pay.

#### **SECTION 9. INJURY/DISABILITY**

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than 8 hours wages for that day. Further, the employee shall be rehired at such time as able to return to duties provided there is still Program Work available for which the employee is qualified and able to perform.

#### **SECTION 10. TIME KEEPING**

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

#### **SECTION 11. MEAL PERIOD**

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts or which provides for staggered lunch periods within a craft or trade. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

#### **SECTION 12. BREAK PERIODS**

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's work location.

### **ARTICLE 13 - APPRENTICES**

#### **SECTION 1. RATIOS**

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications in the maximum ratio permitted by the New York State Department of Labor or the maximum allowed per trade. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Schedule A. The parties encourage, as an appropriate source of apprentice recruitment consistent with the rules and operations of the affiliated unions' apprentice-programs, the use of the Edward J. Malloy Initiative for Construction Skills, Non-Traditional Employment for Women and Helmets to Hardhats.

## **ARTICLE 14-SAFETY PROTECTION OF PERSON AND PROPERTY**

### **SECTION 1. SAFETY REQUIREMENTS**

Each Contractor will ensure that applicable OSHA and safety requirements are at all times maintained on the Program Work site and the employees and Unions agree to cooperate fully with these efforts to the extent consistent with their rights and obligations under the law. Employees will cooperate with employer safety policies and will perform their work at all times in a safe manner and protect themselves and the property of the Contractor and Agency from injury or harm, to the extent consistent with their rights and obligations under the law. Failure to do so will be grounds for discipline, including discharge.

### **SECTION 2. CONTRACTOR RULES**

Employees covered by this Agreement shall at all times be bound by the

reasonable safety, security, and visitor rules as established by the Contractors and the Construction Manager for this Program Work. Such rules will be published and posted in conspicuous places throughout the Program Work sites. Any site security and access policies established by the Construction Manager or General Contractor intended for specific application to the construction workforce for Program Work and that are not established pursuant to an Agency directive shall be implemented only after notice to the BCTC and its affiliates and an opportunity for negotiation and resolution by the Labor Management Committee.

### **SECTION 3. INSPECTIONS**

The Contractors and Construction Manager retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

### **ARTICLE 15 - TEMPORARY SERVICES**

Temporary services, i.e. all temporary heat, climate control, water, power and light, shall only be required upon the specific request of the Agency or Construction Manager, and when so requested shall be assigned to the appropriate trade claiming jurisdiction. Temporary system coverage shall be provided by the appropriate Contractors' existing employees during working hours in which a shift is scheduled for employees of this Contractor. The Agency or Construction Manager may determine the need for temporary system coverage requirements during non-working hours, which may be limited to one person per applicable trade where practicable. There shall be no stacking of trades on temporary services. In the event a temporary system is claimed by multiple trades, the matter shall be resolved through the New York Plan for Jurisdictional Disputes.

### **ARTICLE 16 - NO DISCRIMINATION**

#### **SECTION 1. COOPERATIVE EFFORTS**

The Contractors and Unions agree that they will not discriminate against any employee or applicant for employment because of creed, race, color, religion, sex, sexual orientation, national origin, marital status, citizenship status, disability, age or any other status provided by law, in any manner prohibited by law or regulation.

## **SECTION 2. LANGUAGE OF AGREEMENT**

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

## **ARTICLE 17- GENERAL TERMS**

### **SECTION 1. PROJECT RULES**

A. The Construction Manager and the Contractors shall establish such reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work. These rules will be explained at the pre-job conference and posted at the Program Work sites and may be amended thereafter as necessary. Notice of amendments will be provided to the appropriate Local Union. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

B. The parties adopt and incorporate the BCTC's Standards of Excellence as annexed hereto as Exhibit "B".

### **SECTION 2. TOOLS OF THE TRADE**

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the

trade. There shall be no restrictions on the emergency use of any tools or equipment by any ~~qualified employee or on the use of any tools or equipment for the performance of work within~~ the employee's jurisdiction.

### **SECTION 3. SUPERVISION**

Employees shall work under the supervision of the craft foreperson or general foreperson.

### **SECTION 4. TRAVEL ALLOWANCES**

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

### **SECTION 5. FULL WORK DAY**

Employees shall be at their work area at the starting time established by the Contractor, provided they are provided access to the work area. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

### **SECTION 6. COOPERATION AND WAIVER**

The Construction Manager, Contractors and the Unions will cooperate in seeking any NYS Department of Labor, or any other government, approvals that may be needed for implementation of any terms of this Agreement. In addition, the Council, on their own behalf and on behalf of its participating affiliated Local Unions and their individual members, intend the provisions of this Agreement to control to the greatest extent permitted by law, notwithstanding contrary provisions of any applicable prevailing wage, or other, law and intend this Agreement to constitute a waiver of any such prevailing wage, or other, law to the greatest extent permissible only for work within the scope of this Agreement, including specifically, but not limited to those provisions relating to shift, night, and similar differentials and premiums. This Agreement does

not, however, constitute a waiver or modification of the prevailing wage schedules applicable to work not covered by this Agreement.

## **ARTICLE 18. SAVINGS AND SEPARABILITY**

### **SECTION 1. THIS AGREEMENT**

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or if such application may cause the loss of Program funding or any New York State Labor Law exemption for all or any part of the Program Work, the provision or provisions involved (and/or its application to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the remainder of the Agreement shall remain in full force and effect to the extent allowed by law (and to the extent no funding or exemption is lost), unless the part or parts so found to be in violation of law or to cause such loss are wholly inseparable from the remaining portions of the Agreement and/or are material to the purposes of the Agreement. In the event a court of competent jurisdiction finds any portion of the Agreement to trigger the foregoing, the parties will immediately enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the court determination and the intent of the parties hereto for contracts to be let in the future.

### **SECTION 2. THE BID SPECIFICATIONS**

In the event that the Agency's (or Construction Manager's) bid specifications, or other action, requiring that a successful bidder (and subcontractor) become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or may cause the loss of Program funding or any New York State Labor Law exemption for all or any part of the Program Work, such requirement (and/or its application

to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the Agreement shall remain in full force and effect to the extent allowed by law and to the extent no funding or exemption is lost). In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction only where the Agency and Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court or other action taken and the intent of the parties for contracts to be let in the future.

### **SECTION 3. NON-LIABILITY**

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the Agency, the Construction Manager, any Contractor, nor any Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order or injunction, other determination, or in order to maintain funding or a New York State Labor Law exemption for Program Work. Bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

### **SECTION 4. NON-WAIVER**

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

## **ARTICLE 19 - FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS**

### **SECTION 1. CHANGES TO AREA CONTRACTS**

A. Schedule A to this Agreement shall continue in full force and effect until the Contractor and/or Union parties to the Area Collective Bargaining Agreements which are the basis for Schedule A notify the Agency and Construction Manager in writing of the hourly rate changes agreed to in that Area Collective Bargaining which are applicable to work covered by

this Agreement and their effective dates.

~~B. It is agreed that any provisions negotiated into Schedule A collective~~  
bargaining agreements will not apply to work under this Agreement if such provisions are less favorable to those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on Program Work if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedule A of provisions agreed upon in the renegotiation of Area Collective Bargaining Agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

## **SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS**

The Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Program Work by any Local Union involved in the renegotiation of Area Local Collective Bargaining Agreements nor shall there be any lock-out on such Program Work affecting a Local Union during the course of such renegotiations.

## **ARTICLE 20 - WORKERS' COMPENSATION ADR**

### **SECTION 1.**

An ADR program may be negotiated and participation in the ADR Program will be optional by trade.



## **ARTICLE 21 - HELMETS TO HARDHATS**

### **Section 1.**

The Contractors and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

### **Section 2.**

The Unions and Contractors agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on this Project and of apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective

as of the \_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

FOR BUILDING AND CONSTRUCTION TRADES COUNCIL  
OF GREATER NEW YORK AND VICINITY

BY: Gary LaBarbera  
Gary LaBarbera, President

FOR NEW YORK CITY DEPARTMENT OF SANITATION

BY: \_\_\_\_\_  
John J. Doherty, Commissioner

APPROVED AS TO FORM:

\_\_\_\_\_  
ACTING CORPORATION COUNSEL  
NEW YORK CITY

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective

as of the \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_

FOR BUILDING AND CONSTRUCTION TRADES COUNCIL  
OF GREATER NEW YORK AND VICINITY I

BY: \_\_\_\_\_  
(Name/Title)

FOR NEW YORK CITY

BY: John J. Doherty  
(Name/Title)

APPROVED AS TO FORM:

Steve Stein Cusumano  
ACTING CORPORATION COUNSEL  
NEW YORK CITY

DEC 18 2009

## **List of Signatory Unions**

Blasterers and Drillers Local #29

Bricklayers Local No. 1

Boiler Makers Local No. 5

Carpenters District Council

Cement Masons No. 780

Derrickmen and Riggers Union No. 197

Concrete Workers District Council No. 16, including Cement and Concrete Workers Nos. 6-A, 18-A, and 20

Electrical Local No. 3

Drywall Tapers 1974

Elevator Constructors No. 1

Heat & Frost Insulators Local Union No. 12A

Heat & Frost Insulators Local Union No. 12

Iron Workers No. 40

Iron Workers District Council

Laborers Local No. 78 Asbestos & Lead Abatement

Iron Workers No. 361

Laborers Construction and General Building No. 79

Laborers Local 731

Lathers Metallic Local No. 46

Local Union 8A Glaziers No. 1281

Mason Tenders District Council

Metal Polishers DC 9

Painters District Council No. 9

Painters Structural Steel No. 806

Ornamental Iron Workers No. 580

Plasters Local Union No. 262

Pavers & Road Builders District Council No. 1

Plumbers No. 1

Sheet Metal Workers Local No. 28

Roofers & Waterproofers No. 8

Sheet Metal Workers Local No. 137

Steamfitters Local Union No. 638, including Metal Trades Division

Teamsters Local Union 813

Teamsters Local Union 814

Tile, Marble & Terrazzo B.A.C. Local Union No. 7

### PLA Schedule A

The following Collective Bargaining Agreements, as this Schedule may be amended from time to time in accordance with the Agreement, constitute Schedule A:

- (1) Agreement between the Boilermakers Association of Greater New York, Inc. and the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers AFL-CIO, Lodge No. 5, September 1, 2006 - December 31, 2009.
- (2) Agreement between Association of Cement and Concrete Contractors of New York, Inc. and Cement and Concrete Workers comprised of Local No. 6A, Local No. 18A, Local No. 20 and the Employer, July 1, 2008 - June 30, 2011.
- (3) Agreement between the Cement League and the District Council of Cement and Concrete Workers: Comprised of Local No. 6A, Local No. 18A, Local No. 20; July 1, 2008 - June 30, 2011.
- (4) Agreement between the Cement League and the United Cement Masons' Union Local No. 780, Clarified & Extended from October 23, 1940 to June 30, 2011.
- (5) Building Construction agreement between the Building Contractors Association, Inc. and the District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America, AFL-CIO, July 1, 2006 - June 30, 2011.
- (6) General Contractors Association - Carpenters 2006; Agreement Between Members of the General Contractors Association of New York, Inc. and the District Council of Carpenters of New York City and Vicinity, July 1, 2006 - June 30, 2011.
- (7) Trade Agreement between Drywall Tapers and Pointers of Greater New York Local Union 1974, affiliated with International Union of Painters and Allied Trades, AFL-CIO and Drywall Taping Contractors' Association of Greater New York and the Association of Wall-Ceiling & Carpentry Industry of New York, Inc., September 6, 2006 - June 28, 2011; Independent Agreement between Local Union 1974 and Employer.
- (8) Agreement between Allied Building Metal Industries, Inc. and Local Union Nos. 40 and 361 of the International Association of Bridge, Structural and Ornamental and Reinforcing Iron Workers AFL-CIO, July 1, 2008 - June 30, 2014.
- (9) Agreement between Independent Contractors and Local #46 Metallic Lathers Union and Reinforcing Ironworkers of New York and Vicinity of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers, July 1, 2008 - June 30, 2014.
- (10) Agreement of Working Conditions between the Independent Insulation Contractors Association of New York City Inc. and the International Association of Heat and Frost Insulators and Asbestos Workers Local No. 12 of New York City, 2008-2014.

(11) Mason Tenders District Council of Greater New York Master Independent Collective Bargaining Agreement, 2008-2011.

(12) Trade Agreement between District Council No. 9, International Union of Painters and Allied Trades, AFL-CIO and the Association of Master Painters and Decorators of New York, Inc. and the Association of Wall, Ceiling & Carpentry Industries of New York, Inc. and the Window and Plate Glass Dealers Association, May 1, 2005 - April 30, 2011.

(13) Trade Agreement between Enterprise Association Local Union 638 and Mechanical Contractors Association of New York, Inc., July 1, 2008 - June 30, 2011.

(14) Agreement between Allied Building Metal Industries Inc. and Architectural and Ornamental Iron Workers Local Union No. 580 AFL-CIO; July 1, 2008 - June 30, 2011.

(15) Official Working Agreement between Service Contractors Division of the Mechanical Contractors Association of New York and Enterprise Association Metal Trades Branch Local Union 638, July 1, 2007 - June 30, 2010.

(16) Agreement between Association of Contracting Plumbers of the City of New York, Inc. and Local Union No 1 of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada, July 1, 2007 - June 30, 2010.

(17) Agreement and Working Rules between New York Electrical Contractors Association, Inc. and the Association of Electrical Contractors, Inc. and Local Union No. 3 International Brotherhood of Electrical Workers, AFL-CIO, May 10, 2007 - May 13, 2010.

(18) Official Working Agreement between Service Contractors Division of the Mechanical Contractors Association of New York, Inc. and Enterprise Association Metal Trades Branch Local Union 638, Refrigeration, Air Conditioning, Air Cooling, Oil Burner and Stoker Service and Maintenance Technicians, July 1, 2007 - June 30, 2010.

(19) Structural Steel and Bridge Painters of Greater New York, Local Union No. 806, District Council No. 9, International Union of Painters and Allied Trades, AFL-CIO, CLC and New York Structural Steel Painting Contractors Association, Inc.; Collective Bargaining Agreement, October 1, 2005 - September 30, 2011.

(20) Trade Agreement between United Derrickmen & Riggers Association, Local No. 197 of New York, All long Island, Westchester and Vicinity and Building Stone and Pre-Case Contractors Association, 2008.

(21) Agreement between the Greater New York and New Jersey Tile Contractors Association, Inc., and the Tile Setters and Tile Finishers Union of New York and New Jersey, Local Union No. 7 of the International Union of Bricklayers and Allied Craftworkers, June 8, 2009 - June 2, 2013.

(22) Agreement between The Building Contractors Association, Inc. and International Union of Operating Engineers Local 15 and 15 A, July 1, 2006-June 30, 2011.

(23) Agreement dated as of July 1, 2006 between Building Contractors Association and International Union of Operating Engineers Local 14-14B, July 1, 2006-June 30, 2011.

(24) Agreement Between The Building Contractors Association, Inc. and International Union of Operating Engineers Local 15D affiliated with the AFL-CIO, July 1, 2006-June 30, 2011.

(25) Local 282 International Brotherhood of Teamsters High Rise Contract, Building Contractors Association and Independents, 2008-2013.

(26) Building, Concrete, Excavation & Common Laborers Union Local No. 731 Independent Agreement, July 1, 2006-June 30, 2012.

(27) March 17, 2009 Agreement between ThyssenKrupp Elevator Corp. and International Union of Elevator Constructors, Local 1 of NY and NJ, 2009-2014.

(28) Working Agreement Local Union No. 8 United Union of Roofers, Waterproofers and Allied Workers and Roofing and Waterproofing Contractor's Association of New York and Vicinity, July 1, 2009-June 30, 2011.

(29) Standard Form Collective Bargaining Agreement between Sheet Metal Workers' International Association Local Union #137 and the Greater New York Sign Association, July 16, 2007 – July 15, 2010.

(30) Trade Agreement between \_\_\_\_\_ and Local No. 1 New York of the International Union of Bricklayers and Allied Craftworkers, July 1, 2008 – July 30, 2011.



**Project Labor Agreement - - Letter of Assent**

Dear:

The undersigned party confirms that it agrees to be a party to and be bound by the New York Agency, Project Labor Agreement as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Project Labor Agreement, its Schedules, Addenda and Exhibits are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor (hereinafter Contractor) on the Project known as \_\_\_\_\_ and located at \_\_\_\_\_ (hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECT, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

- (1) Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all schedules; amendments and supplements now existing or which are later made thereto:
- (2) Agrees to be bound by the legally established collective bargaining agreements and local trust agreements as set forth in the Project Labor Agreement and this Agreement but only to the extent of Program Work and as required by the PLA.
- (3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor but only to the extent of Program Work as required by the PLA.
- (4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of said Agreement. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier subcontractor it has engaged or may engage to work on the Project. Labor harmony disputes/issues shall be subject to the Labor Management Committee provisions.
- (5) Agrees to secure from any Contractor(s) (as defined in said Agreement) which is or becomes a Subcontractor (of any tier), to it, a duly executed Agreement to be Bound in from identical to this document.

Dated: \_\_\_\_\_  
(Name of Contractor or subcontractor)

\_\_\_\_\_  
(Name of CM; GC; Contractor or  
Higher Level Subcontractor) (Authorized Officer & Title)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Phone) (Fax)

Contractor's State License

# \_\_\_\_\_

Sworn to before me this  
\_\_\_\_ day of \_\_\_\_\_, 2009

\_\_\_\_\_  
Notary Public

**NEW YORK CITY BUILDING AND CONSTRUCTION TRADES COUNCIL**

**STANDARDS OF EXCELLENCE**

The purpose of this Standard of Excellence is to reinforce the pride of every construction worker and the commitment to be the most skilled, most productive and safest workforce available to construction employers and users in the City of New York. It is the commitment of every affiliated local union to use our training and skills to produce the highest quality work and to exercise safe and productive work practices.

The rank and file members represented by the affiliated local unions acknowledge and adopt the following standards:

- *Provide a full days work for a full days pay;*
- *Safely work towards the timely completion of the job;*
- *Arrive to work on time and work until the contractual quitting time;*
- *Adhere to contractual lunch and break times;*
- *Promote a drug and alcohol free work site;*
- *Work in accordance with all applicable safety rules and procedures;*
- *Allow union representatives to handle job site disputes and grievances without resort to slowdowns, or unlawful job disruptions;*
- *Respect management directives that are safe, reasonable and legitimate;*
- *Respect the rights of co-workers;*
- *Respect the property rights of the owner, management and contractors.*

The Unions affiliated with the New York City Building and Construction Trades Council will expect the signatory contractors to safely and efficiently manage their jobs and the unions see this as a corresponding obligation of the contractors under this Standard of Excellence. The affiliated unions will expect the following from its signatory contractors:

- *Management adherence to the collective bargaining agreements;*
- *Communication and cooperation with the trade foremen and stewards;*
- *Efficient, safe and sanitary management of the job site;*
- *Efficient job scheduling to mitigate and minimize unproductive time;*
- *Efficient and adequate staffing by properly trained employees by trade;*
- *Efficient delivery schedules and availability of equipment and tools to ensure efficient job progress;*
- *Ensure proper blueprints, specifications and layout instructions and material are available in a timely manner*
- *Promote job site dispute resolution and leadership skills to mitigate such disputes;*
- *Treatment of all employees in a respectful and dignified manner acknowledging their contributions to a successful project.*

The affiliated unions and their signatory contractors shall ensure that both the rank and file members and the management staff shall be properly trained in the obligations undertaken in the Standard of Excellence.

# **NOTICE TO BIDDERS**

## **DAMAGES FOR DELAY PILOT PROGRAM**

**Please be advised that this contract is part of a pilot program in which the Standard Construction Contract provisions concerning delay damages have been revised to allow contractors to be reimbursed for specified additional costs that are attributable to a delay in the performance of the work resulting from certain acts or omissions of the City agency or its representatives. Certain changes are highlighted here to alert bidders to the pilot program. Please see Articles 11, 12.3, and 13.10 of the Standard Construction Contract for a full understanding and the actual text of the pilot program. The text of the revised Standard Construction Contract is the controlling document should there be any discrepancies between this notice and the Standard Construction Contract.**

Changes to Articles 11, 12.3, and 13.10 of the Standard Construction Contract permit contractors to make claims for delay damages relating to the following circumstances:

The failure of the City to take reasonable measures to coordinate and progress the Work;

Extended delays attributable to the City in the review or issuance of change orders, in shop drawing reviews and approvals or as a result of the cumulative impact of multiple change orders, which constitute a material change to the Work and which have a verifiable impact on project costs.

The unavailability of the site for an extended period of time that significantly affects the scheduled completion of the contract.

The issuance by the City of a stop work order relative to a substantial portion of work for a period exceeding thirty days, that was not brought about through any action or omission of the Contractor.

Differing site conditions that were not known or reasonably ascertainable on a pre-bid inspection of the site or review of the bid documents or other publicly available sources and that are not ordinarily encountered in the Project's geographical area or neighborhood or in the type of work to be performed.

Delays caused by the City's bad faith or its willful, malicious, or grossly negligent conduct;

Delays not contemplated by the parties;

Delays so unreasonable that they constitute an intentional abandonment of the Contract by the City; and

Delays resulting from the City's breach of a fundamental obligation of the Contract.

Please see Article 11.4 for provisions regarding compensable delays.

Specific exclusions to claims for damages also apply, such as for third party (non-City) acts and omissions, court orders, strikes or *force majeure* events. For provisions related to non-compensable delays, please see Article 11.5.

For those delays where damages are available, Article 11 also sets forth what costs are recoverable. Please see Article 11.7 for which costs are recoverable and which costs are non-recoverable.

Article 11 also contains provisions concerning notice and documentation of claims. Please see Articles 11.1, 11.2, and 11.6. Contractors must comply with the notice requirements in order to preserve their claims. Consequently, please read these sections carefully. Delay damages are compensable only if they were actually, reasonably and necessarily incurred and are verified by appropriate documentation submitted at the appropriate times.

Claims for delay damages are not covered by the dispute resolution process in Article 27 of the Standard Construction Contract. See Article 11.8. When the amount of delay damages are agreed upon, such damages may be paid through a change order.

# NOTICE TO BIDDERS

Please be advised that the City of New York has revised the form of the performance bond that is required for City construction contracts that do not exceed \$5 million. The form of bond required for contracts that are greater than \$5 million has not changed. The City now has two approved forms. One form is to be used for contracts that do not exceed \$5 million and one form is to be used for contracts above \$5 million. The City's payment bond remains unchanged.

**The new bond form for contracts that do not exceed \$5 million has been approved by the U.S. Small Business Administration ("SBA") for participation in their Bond Guarantee Program.** The SBA's Bond Guarantee Program enables eligible small businesses to obtain or increase bonding by having the SBA act as a partial guarantor of the contractor to the surety. If you are interested in participating in this program, we suggest that you contact your broker or the SBA.

In order to maximize participation by small businesses in the SBA Guarantee Program, the City also encourages prime contractors who are awarded contracts greater than \$5 million to allow their subcontractors to use the SBA-approved form, particularly on contracts that are subject to Local Law 129 (the M/WBE program), if the prime contractor requires subcontractors to obtain performance bonds.



**CITY OF NEW YORK**  
**DEPARTMENT OF**  
**DESIGN AND CONSTRUCTION**  
**DIVISION OF STRUCTURES**

**INFORMATION FOR BIDDERS**

**DELAY DAMAGES PILOT**

**September 2008**

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## INFORMATION FOR BIDDERS

### 1. Description and Location of Work

The description and location of the work for which bids are requested are specified in Attachment 1, "Bid Information". Attachment 1 is included in the Bid Booklet.

### 2. Time and Place for Receipt of Bids

Sealed bids shall be received on or before the date and hour specified in Attachment 1, at which time they will be publicly opened and read aloud in the presence of the Commissioner or his or her representative, and any bidders who may desire to be present.

### 3. Definitions

The definitions set forth in the Procurement Policy Board Rules shall apply to this Invitation For Bids.

### 4. Invitation For Bids and Contract Documents

(A) Except for titles, sub-titles, headings, running headlines, tables of contents and indices (all of which are printed herein merely for convenience) the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of the Contract and the Invitation for Bids.

- (1) All provisions required by law to be inserted in this Contract, whether actually inserted or not
- (2) The Contract Drawings and Specifications
- (3) The General Conditions, the General Requirements and the Special Conditions, if any
- (4) The Contract
- (5) The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet
- (6) The Budget Director's Certificate; all Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed with the Work.

(B) For particulars as to this procurement, including quantity and quality of the purchase, extent of the work or labor to be performed, delivery and performance schedule, and any other special instructions, prospective bidders are referred to the Invitation For Bids Documents. A copy of such documents can be obtained at the location set forth in Attachment 1.

(C) Deposit for Copy of Invitation For Bids Documents: Prospective bidders may obtain a copy of the Invitation For Bids Documents by complying with the conditions set forth in the Notice of Solicitation. The deposit must be in the form of a check or money order made payable to the City of New York, and drawn upon a state or national bank or trust company, or a check of such bank or trust company signed by a duly authorized officer thereof.

(D) Return of Invitation For Bids Documents: All Invitation For Bids Documents must be returned to the Department upon request. If the bidder elects not to submit a bid thereunder, the Invitation For Bids Documents shall be returned to the Department, along with a statement that no bid will be submitted.

(E) Return of Deposit: Such deposit will be returned within 30 days after the award of the contract or the rejection of all bids as set forth in the advertisement, provided the Invitation For Bids Documents are returned to the location specified in Attachment 1, in physical condition satisfactory to the Commissioner.

(F) Additional Copies: Additional copies of the Invitation For Bids Documents may be obtained, subject to the conditions set forth in the advertisement for bids.

5. Pre-Bid Conference

A pre-bid conference shall be held as set forth in Attachment 1. Nothing stated at the pre-bid conference shall change the terms or conditions of the Invitation For Bids Documents, unless a change is made by written amendment as provided in Section 9 below. Failure to attend a mandatory pre-bid conference shall constitute grounds for the rejection of the bid.

6. Agency Contact

Any questions or correspondence relating to this bid solicitation shall be addressed to the Agency Contact person specified in Attachment 1.

7. Bidder's Oath

(A) The bid shall be properly signed by an authorized representative of the bidder and the bid shall be verified by the written oath of the authorized representative who signed the bid, that the several matters stated and information furnished therein are in all aspects true.

(B) A materially false statement willfully or fraudulently made in connection with the bid or any of the forms completed and submitted with the bid may result in the termination of any Contract between the City and the Bidder. As a result, the Bidder may be barred from participating in future City contracts as well as be subject to possible criminal prosecution.

8. Examination and Viewing of Site, Consideration of Other Sources of Information and Changed Conditions

(A) Pre-Bidding (Investigation) Viewing of Site - Bidders must carefully view and examine the site of the proposed work, as well as its adjacent area, and seek other usual sources of information, for they will be conclusively presumed to have full knowledge of any and all conditions on, about or above the site relating to or affecting in any way the performance of the work to be done under the Contract which were or should have been indicated to a reasonably prudent bidder. To arrange a date for visiting the work site, bidders are to contact the Agency Contact person specified in Attachment 1.

(B) Should the contractor encounter during the progress of the work subsurface conditions at the site materially differing from any shown on the Contract Drawings or indicated in the Specifications or such subsurface conditions as could not reasonably have been anticipated by the contractor and were not anticipated by the City, which conditions will materially affect the cost of the work to be done under the Contract, the attention of the Commissioner must be called immediately to such conditions before they are disturbed. The Commissioner shall thereupon promptly investigate the conditions. If he finds that they do so materially differ, or that they could not reasonably have been anticipated by the contractor and were not anticipated by the City, the Contract may be modified with his written approval.

9. Examination of Proposed Contract

(A) Request for Interpretation or Correction: Prospective bidders must examine the Contract Documents carefully and before bidding must request the Commissioner in writing for an interpretation or correction of every patent ambiguity, inconsistency or error therein which should have been discovered by a reasonably prudent bidder. Such interpretation or correction, as well as any additional contract provisions the Commissioner may decide to include, will be issued in writing by the Commissioner as an addendum to the Contract, which will be transmitted to each person recorded as having received a copy of the Contract Documents from the Department. Transmission of such addendum will be by mail, e-mail, facsimile or hand delivery. Such addendum will also be posted at the place where the Contract Documents are available for the inspection of prospective bidders. Upon transmission as provided for herein, such addendum shall become a part of the Contract Documents, and binding on all bidders, whether or not actual notice of such addendum is shown.

(B) Only Commissioner's Interpretation or Correction Binding: Only the written interpretation or correction so given by the Commissioner shall be binding, and prospective bidders are warned that no other officer, agent or employee of the City is authorized to give information concerning, or to explain or interpret, the Contract.

(C) Documents given to a subcontractor for the purpose of soliciting the subcontractor's bid shall include either a copy of the bid cover sheet or a separate information sheet setting forth the project name, the Contract number (if available), the contracting agency and the Project's location.

10. Form of Bid

Each bid must be submitted upon the prescribed form and must contain: a) the name, residence and place of business of the person or persons making the same; b) the names of all persons interested therein, and if no other person is so interested, such fact must be distinctly stated; c) a statement to the effect that it is made without any connection with any other person making a bid for the same purpose and that it is in all respects fair and without collusion or fraud; d) a statement that no Council member or other officer or employee or person whose salary is payable in whole or part from the City Treasury is directly or indirectly interested therein or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof; e) a statement that the bidder is not in arrears to the City or to any agency upon a debt or contract or taxes, and is not a defaulter as surety or otherwise upon any obligation to the City to any agency thereof, except as set forth in the bid.

THE BID SHALL BE TYPEWRITTEN OR WRITTEN LEGIBLY IN INK. THE BID SHALL BE SIGNED IN INK. ERASURES OR ALTERATIONS SHALL BE INITIALED BY THE SIGNER IN INK. FAILURE TO CONFORM TO THE REQUIREMENTS OF THIS SECTION 10 SHALL RESULT IN THE REJECTION OF THE BID.

11. Irrevocability of Bid

The prices set forth in the bid cannot be revoked and shall be effective until the award of the Contract, unless the bid is withdrawn as provided for in Sections 15 and 18 below.

12. Acknowledgment of Amendments

The receipt of any amendment to the Contract Documents shall be acknowledged by the bidder in its bid submission.

13. Bid Samples and Descriptive Literature

Bid samples and descriptive literature shall not be submitted by the bidder, unless expressly requested elsewhere in the Contract or Contract Documents. Any unsolicited bid samples or descriptive literature which are submitted shall not be examined or tested and shall not be deemed to vary any of the provisions of this Contract.

14. Proprietary Information/Trade Secrets

(A) The bidder shall identify those portions of the bid which it deems to be confidential, proprietary information or trade secrets, and provide justification why such materials shall not be disclosed by the City. All such materials shall be clearly indicated by stamping the pages on which such information appears, at the top and bottom thereof with the word "Confidential". Such materials stamped "Confidential" must be easily separable from the non-confidential sections of the bid.

(B) All such materials so indicated shall be reviewed by the Agency and any decision not to honor a request for confidentiality shall be communicated in writing to the bidder. For those bids which are unsuccessful, all such confidential materials shall be returned to the bidder. Prices, makes and model or catalog numbers of the items offered, deliveries, and terms of payment shall be publicly available after bid opening, regardless of any designation of confidentiality made by the bidder.

15. Pre-Opening Modification or Withdrawal of Bids

Bids may be modified or withdrawn by written notice received in the office designated in Attachment 1, before the time and date set for the bid opening. If a bid is withdrawn in accordance with this Section, the bid security, if any, shall be returned to the bidder.

16. Bid Evaluation and Award

In accordance with the New York City Charter, the Procurement Policy Board Rules and the terms and conditions of this Invitation For Bids, this Contract shall be awarded, if at all, to the responsible bidder whose bid meets the requirements and evaluation criteria set forth in the Invitation For Bids, and whose bid price is either the most favorable bid price or, if the Invitation For Bids so states, the most favorable evaluated bid price. A bid may not be evaluated for any requirement or criterion that is not disclosed in the Invitation For Bids.

Restriction: No negotiations with any bidder shall be allowed to take place except under the circumstances and in the manner set forth in Section 21. Nothing in this Section shall be deemed to permit a contract award to a bidder submitting a higher quality item than that designated in the Invitation For Bids, if that bid is not also the most favorable bid.

17. Late Bids, Late Withdrawals and Late Modifications

Any bid received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. Any request for withdrawal or modification received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. The exception to this provision is that a late modification of a successful bid that makes the bid terms more favorable to the City shall be considered at any time it is received.

18. Withdrawal of Bids.

Except as provided for in Section 15, above, a bidder may not withdraw its bid before the expiration of forty-five (45) days after the date of the opening of bids; thereafter, a bidder may withdraw its bid only in writing and in advance of an actual award. If within sixty (60) days after the execution of the Contract, the Commissioner fails to fix the date for commencement of work by written notice to the bidder, the bidder, at his option, may ask to be relieved of his obligation to perform the work called for by written notice to the Commissioner. If such notice is given to the Commissioner, and the request to withdraw is granted, the bidder waives all claims in connection with this Contract.

19. Mistake in Bids

(A) Mistake Discovered Before Bid Opening: A bidder may correct mistakes discovered before the time and date set for bid opening by withdrawing or correcting the bid as provided in Section 15 above.

(B) Mistakes Discovered Before Award

(1) In accordance with General Municipal Law (Section 103, subdivision 11), where a unilateral error or mistake is discovered in a bid, such bid may be withdrawn upon written approval of the Agency Chief Contracting Officer if the following conditions are met:

- (a) The mistake is known or made known to the agency prior to the awarding of the Contract or within 3 days after the opening of the bid, whichever period is shorter; and
- (b) The price bid was based upon an error of such magnitude that enforcement would be unconscionable; and

- (c) The bid was submitted in good faith and the bidder submits credible evidence that the mistake was a clerical error as opposed to a judgment error; and
- (d) The error in the bid is actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, material or services made directly in the compilation of the bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of the original work paper, documents, or materials used in the preparation of the bid sought to be withdrawn; and
- (e) It is possible to place the agency in the same position as existed prior to the bid.

(2) Unless otherwise required by law, the sole remedy for a bid mistake in accordance with this Article shall be withdrawal of the bid, and the return of the bid bond or other security, if any, to the bidder. Thereafter, the agency may, in its discretion, award the Contract to the next lowest bidder or rebid the Contract. Any amendment to or reformation of a bid or a Contract to rectify such an error or mistake therein is strictly prohibited.

(3) If the mistake and the intended correct bid are clearly evident on the face of the bid document, the bid shall be corrected to the intended correct bid and may not be withdrawn. Examples of mistakes that may be corrected are typographical errors, errors in extending unit prices, transposition errors and arithmetical errors.

## 20. Low Tie Bids

(A) When two or more low responsive bids from responsible bidders are identical in price, meeting all the requirements and criteria set forth in the Invitation For Bids, the Agency Chief Contracting Officer will break the tie in the following manner and order of priority:

- (1) Award to a certified New York City small, minority or woman-owned business entity bidder;
- (2) Award to a New York City bidder;
- (3) Award to a certified New York State small, minority or woman-owned business bidder;
- (4) Award to a New York State bidder.

(B) If two or more bidders still remain equally eligible after application of paragraph (A) above, award shall be made by a drawing by lot limited to those bidders. The bidders involved shall be invited to attend the drawing. A witness shall be present to verify the drawing and shall certify the results on the bid tabulation sheet.

## 21. Rejection of Bids

(A) Rejection of Individual Bids: The Agency may reject a bid if:

- (1) The bidder fails to furnish any of the information required pursuant to Section 24 or 28 hereof; or if
- (2) The bidder is determined to be not responsible pursuant to the Procurement Policy Board Rules; or if
- (3) The bid is determined to be non-responsive pursuant to the Procurement Policy Board Rules; or if
- (4) The bid, in the opinion of the Agency Chief Contracting Officer, contains unbalanced bid prices and is thus non-responsive, unless the bidder can show that the prices are not unbalanced for the probable required quantity of items, or if the imbalance is corrected pursuant to Section 15.

(B) Rejection of All Bids: The Agency, upon written approval by the Agency Chief Contracting Officer, may reject all bids and may elect to resolicit bids if in its sole opinion it shall deem it in the best interest of the City so to do.

(C) Rejection of All Bids and Negotiation With All Responsible Bidders: The Agency Head may determine that it is appropriate to cancel the Invitation For Bids after bid opening and before award and to complete the acquisition by negotiation. This determination shall be based on one of the following reasons:

- (1) All otherwise acceptable bids received are at unreasonable prices, or only one bid is received and the Agency Chief Contracting Officer cannot determine the reasonableness of the bid price, or no responsive bid has been received from a responsible bidder; or
- (2) In the judgment of the Agency Chief Contracting Officer, the bids were not independently arrived at in open competition, were collusive, or were submitted in bad faith.

(D) When the Agency has determined that the Invitation for Bids is to be canceled and that use of negotiation is appropriate to complete the acquisition, the contracting officer may negotiate and award the Contract without issuing a new solicitation, subject to the following conditions:

- (1) prior notice of the intention to negotiate and a reasonable opportunity to negotiate have been given by the contracting officer to each responsible bidder that submitted a bid in response to the Invitation for Bids;
- (2) the negotiated price is the lowest negotiated price offered by a responsible bidder; and
- (3) the negotiated price is lower than the lowest rejected bid price of a responsible bidder that submitted a bid in response to the Invitation for Bids.

22. Right to Appeal Determinations of Non-Responsiveness or Non-Responsibility and Right to Protest Solicitations and Award

The bidder has the right to appeal a determination of non-responsiveness or non-responsibility and has the right to protest a solicitation and award. For further information concerning these rights, the bidder is directed to the Procurement Policy Board Rules.

23. Affirmative Action and Equal Employment Opportunity

This Invitation For Bids is subject to applicable provisions of Federal, State and Local Laws and executive orders requiring affirmative action and equal employment opportunity.

24. VENDEX Questionnaires

(A) Requirement: Pursuant to Administrative Code Section 6-116.2 and the PPB Rules, bidders may be obligated to complete and submit VENDEX Questionnaires. Generally, if this bid is \$100,000 or more, or if this bid when added to the sum total of all contracts, concessions and franchises the bidder has received from the City and any subcontracts received from City contractors over the past twelve months, equals or exceeds \$100,000, Vendex Questionnaires must be completed. If required, Vendex Questionnaires must be completed and submitted before any award of contract may be made or before approval is given for a proposed subcontractor. Non-compliance with these submission requirements may result in the disqualification of the bid, disapproval of a subcontractor, subsequent withdrawal of approval for the use of an approved subcontractor, or the cancellation of the contract after its award.

(B) Submission: Vendex Questionnaires must be submitted directly to the Mayor's Office of Contract Services, ATTN: Vendex, 253 Broadway, 9<sup>th</sup> Floor, New York, New York 10007. In addition, the bidder must submit a Confirmation of Vendex Compliance to the agency. A form for this confirmation is set forth in the Bid Booklet.

(C) Obtaining Forms: Vendex Questionnaires, as well as detailed instructions, may be obtained at [www.nyc.gov/vendex](http://www.nyc.gov/vendex). The bidder may also obtain Vendex forms and instructions by contacting the Agency Chief Contracting Officer or the contact person for this contract.

25. Complaints About the Bid Process

The New York City Comptroller is charged with the audit of contracts in New York City. Any vendor who believes that there has been unfairness, favoritism or impropriety in the bid process should inform the Comptroller, Office of Contract Administration, One Centre Street, Room 835, New York, New York; telephone number (212)669-2797.

26. Bid, Performance and Payment Security

(A) Bid Security: Each bid must be accompanied by bid security in an amount and type specified in Attachment 1. The bid security shall assure the City of New York of the adherence of the bidder to its proposal, the execution of the Contract, and the furnishing of Performance and Payment Bonds by the bidder, if required in Attachment 1. Bid security shall be returned to the bidder as follows:

- (1) Within ten (10) days after the bid opening, the Comptroller will be notified to return the deposits of all but the three (3) lowest bidders. Within five (5) days after the award, the Comptroller will be notified to return the deposits of the remaining two unsuccessful bidders.
- (2) Within five (5) days after the execution of the Contract and acceptance of the Contractor's bonds, the Comptroller will be notified to return the bid security of the successful bidder or, if performance and payment bonds are not required, only after the sum retained under Article 21 of the Contract equals the amount of the bid security.
- (3) Where all bids are rejected, the Comptroller will be notified to return the deposit of the three (3) lowest bidders at the time of rejection.

(B) Performance and Payment Security: Performance and Payment Security must be provided in an amount and type specified in Attachment 1. The performance and payment security shall be delivered by the contractor prior to or at the time of execution of the Contract. If a contractor fails to deliver the required performance and payment security, its bid security shall be enforced, and an award of Contract may be made to the next lowest responsible and responsive bidder, or the contract may be rebid.

(C) Acceptable Types of Security: Acceptable types of security for bids, performance, and payment shall be limited to the following:

- (1) a one-time bond in a form satisfactory to the City;
- (2) a bank certified check or money order;
- (3) obligations of the City of New York; or
- (4) other financial instruments as determined by the Office of Construction in consultation with the Comptroller.

Whenever the successful bidder deposits obligations of the City of New York as performance and payment security, the Comptroller may sell and use the proceeds thereof for any purpose for which the principal or surety on such bond would be liable under the terms of the Contract. If the money is deposited with the Comptroller, the successful bidder shall not be entitled to receive interest on such money from the City.

(D) Form of Bonds: Security provided in the form of bonds must be prepared on the form of bonds authorized by the City of New York. Forms for bid, performance, and payment bonds are included in the Invitation for Bids Documents. Such bonds must have as surety thereunder such surety company or companies as are: (1) approved by the City of New York; (2) authorized to do business in the State of New York, and (3) approved by the Department of the Treasury of the United States. Premiums for any required bonds must be included in the base bid.

The bidder is advised that submission of a bid bond where the surety on such bond fails to meet the criteria set forth herein, shall result in the rejection of the bid as non-responsive.

The Department of the Treasury of the United States advises that information concerning approved surety companies may be obtained as follows: (1) from the Government Printing Office at 202-512-1800; (2) through the Internet at <http://www.fms.treas.gov/c570/index.html>, and (3) through a computerized public bulletin board, which can be accessed by using your computer modem and dialing 202-874-6887.

(E) Power of Attorney: Attorneys in fact who sign bid, performance, or payment bonds must file with each bond a certified copy of their power of attorney to sign said bonds.

27. Failure to Execute Contract

In the event of failure of the successful bidder to execute the Contract and furnish the required security within ten (10) days after notice of the award of the Contract, the deposit of the successful bidder or so much thereof as shall be applicable to the amount of the award made shall be retained by the City, and the successful bidder shall be liable for and hereby agrees to pay on demand the difference between the price bid and the price for which such Contract shall be subsequently awarded, including the cost of any required reletting and less the amount of such deposit. No plea of mistake in such accepted bid shall be available to the bidder for the recovery of the deposit or as a defense to any action based upon such accepted bid. Further, should the bidder's failure to comply with this Section cause any funding agency, body or group (Federal, State, City, Public, Private, etc.) to terminate, cancel or reduce the funding on this project, the bidder in such event shall be liable also to the City for the amount of actual funding withdrawn by such agency on this project, less the amount of the forfeited deposit.

28. Bidder Responsibilities and Qualifications

(A) Bidders must include with their bids all information necessary for a determination of bidder responsibility, as set forth in the Specifications.

(B) The Agency may require any bidder or prospective bidder to furnish all books of account, records, vouchers, statements or other information concerning the bidder's financial status for examination as may be required by the Agency to ascertain the bidder's responsibility and capability to perform the Contract. If required, a bidder must also submit a sworn statement setting forth such information as the Agency may require concerning present and proposed plant and equipment, the personnel and qualifications of his working organizations, prior experience and performance record.

(C) Oral Examination on Qualifications: In addition thereto, and when directed by the Agency, the bidder, or a responsible officer, agent or employee of the bidder, must submit to an oral examination to be conducted by the Agency in relation to his proposed tentative plan and schedule of operations, and such other matters as the Agency may deem necessary in order to determine the bidder's ability and responsibility to perform the work in accordance with the Contract. Each person so examined must sign and verify a stenographic transcript of such examination noting thereon such corrections as such person may desire to make.

(D) If the bidder fails or refuses to supply any of the documents or information set forth in paragraph (B) hereof or fails to comply with any of the requirements thereof, the Agency may reject the bid.

29. Employment Report

In accordance with Executive Order No. 50 (1980) as modified by Executive Order 108 (1986), the filing of a completed Employment Report (ER) is a requirement of doing business with the City of New York for construction contractors with contracts of \$1,000,000 or more and subcontractors with construction subcontracts of \$750,000 or more. The required forms and information are included in the Bid Booklet.

30. Labor Law Requirements

(A) General: The successful bidder will be required to comply strictly with all Federal, State and local labor laws and regulations.



(B) New York State Labor Law: This Contract is subject to New York State Labor Law Section 220, which requires that construction workers on the site be paid prevailing wages and supplements. The Contractor is reminded that all wage provisions of this Contract will be enforced strictly and failure to comply will be considered when evaluating performance. Noncompliance may result in the contractor being debarred by the City from future contracts. Complaints filed with the Comptroller may result in decisions which may debar a contractor from bidding contracts with any state governmental entity and other political subdivisions.

(C) Records: The Contractor is expected to submit accurate payroll reports and other required documents and verify attendance and job classifications being utilized in compliance with the law, Contract provisions and agency procedures.

31. Insurance

(A) Bidders are advised that the insurance requirements contained herein are regarded as material terms of the Contract. As required by Article 22 of the Contract, the contractor must effect and maintain with companies licensed and authorized to do business in the State of New York, the types of insurance set forth therein, when required by and in the amounts set forth in Schedule A of the General Conditions. Such required insurance must be provided from the date the contractor is ordered to commence work and up to the date of final acceptance of all required work.

(B) The contractor must, within ten days of receipt of the notice of award, submit the following insurance documentation: (a) original certificate of insurance for general liability in the amount required by Schedule A of the General Conditions, and (b) original certificates of insurance or other proof of coverage for workers' compensation and disability benefits, as required by Section 57 of the New York State Workers' Compensation Law and Section 220 of the Disability Benefits Law.

32. Lump Sum Contracts

(A) Comparison of Bids: Bids on Lump Sum Contracts will be compared on the basis of the lump sum price bid, adjusted for alternate prices bid, if any.

(B) Lump Sum Bids for "General Construction Work" which include excavation shall include all necessary excavation work defined in the Specifications as being included in the lump sum bid. The bidder shall also bid a unit price for the additional cost of excavating material which is defined in the Specifications as excavation for which additional payment will be made. The total estimated additional cost of removing such material will be taken as the quantity set forth in the Engineer's Estimate multiplied by the unit price bid. This total estimated cost of additional excavation shall be added to the lump sum bid for the General Construction Work for the purpose of comparing bids to determine the low bidder.

(C) Variations from Engineer's Estimate: The Engineer's Estimate of the quantity of excavation for which additional payment will be made is approximate only and is given solely to be used as a uniform basis for the comparison of bids and such estimate is not to be considered as part of this contract. The quantities actually required to complete the contract work may be more or less than the quantities in the Engineer's Estimate and, if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

33. Unit Price Contracts

(A) Comparison of Bids: Bids on Unit Price Contracts will be compared on the basis of a total estimated price, arrived at by taking the sum of the estimated quantities of such items, in accordance with the Engineer's Estimate of Quantities set forth in the Bid Form, multiplied by the corresponding unit prices, and including any lump sum bids on individual items.

(B) Variations from Engineer's Estimate: Bidders are warned that the Engineer's Estimate of Quantities on the various items of work and materials is approximate only, given solely to be used as a uniform basis for the comparison of bids, and is not be considered part of this contract. The quantities actually required to complete the contract work may be less or more than so estimated, and if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

(C) Overruns: The terms and conditions applicable to overruns of unit price items are set forth in Article 26 of the Contract.

34. Excise Tax

Bidders are referred to the Specifications for information on Federal Excise Tax exemptions.

35. Licenses and Permits

The successful bidder will be required to obtain all necessary licenses and permits necessary to perform the work.

36. Multiple Prime Contractors

If more than one prime contractor will be involved on this project, all contractors are required to examine the Invitation for Bid packages for all other parts of the project.

37. Locally Based Enterprise Requirements (LBE)

This Contract is subject to the requirements of Administrative Code, Section 6-108.1, and the regulations promulgated thereunder. No construction contract will be awarded unless and until these requirements have been complied with in their entirety. The bidder is advised of the provisions set forth below, as well as the provisions with respect to the Locally Based Enterprise Program contained in Article 67 of the Contract. The contractor is advised that:

(A) If any portion of the Contract is subcontracted, not less than ten percent of the total dollar amount of the contract shall be awarded to locally based enterprises ("LBEs"); except, where less than ten percent of the total dollar amount of the Contract is subcontracted, such lesser percentage shall be so awarded.

(B) No contractor shall require performance and payment bonds from LBE subcontractors.

(C) No Contract shall be awarded unless the contractor first identifies in its bid:

- (1) the percentage, dollar amount and type of work to be subcontracted; and
- (2) the percentage, dollar amount and type of work to be subcontracted to LBEs.

(D) Within ten calendar days after notification of low bid, the apparent low bidder shall submit an "LBE Participation Schedule" to the contracting agency. If such schedule does not identify sufficient LBE subcontractors to meet the requirements of Administrative Code Section 6-108.1, the apparent low bidder shall submit documentation of its good faith efforts to meet such requirements.

(1) The "LBE Participation Schedule" shall include:

- (a) the name and address of each LBE that will be given a subcontract,
- (b) the percentage, dollar amount and type of work to be subcontracted to the LBE, and
- (c) the dates when the LBE subcontract work will commence and end.

- (2) The following documents shall be attached to the "LBE Participation Schedule":
  - (a) verification letters from each subcontractor listed in the "LBE Participation Schedule" stating that the LBE will enter into a formal agreement for work,
  - (b) certification documents of any proposed LBE subcontractor which is not on the LBE certified list, and
  - (c) copies of the certification letter of any proposed subcontractor which is an LBE.
- (3) Documentation of good faith efforts to achieve the required LBE percentage shall include as appropriate but not limited to the following:
  - (a) attendance at prebid meetings, when scheduled by the agency, to advise bidders of contract requirements;
  - (b) advertisement where appropriate in general circulation media, trade association publications and small business media of the specific subcontracts that would be at least equal to the percentage goal for LBE utilization specified by the contractor;
  - (c) written notification to association of small, minority and women contractors soliciting specific subcontractors;
  - (d) written notification by certified mail to LBE firms that their interest in the contract is solicited for specific work items and their estimated values;
  - (e) demonstration of efforts made to select portions of the work for performance by LBE firms in order to increase the likelihood of achieving the stated goal;
  - (f) documented efforts to negotiate with LBE firms for specific subcontracts, including at a minimum:
    - (i) The names, address and telephone numbers of LBE firms that are contacted;
    - (ii) A description of the information provided to LBE firms regarding the plans and specifications for portions of the work to be performed;
    - (iii) Documentation showing that no reasonable price can be obtained from LBE firms;
    - (iv) A statement of why agreements with LBE firms were not reached;
  - (g) a statement of the reason for rejecting any LBE firm which the contractor deemed to be unqualified; and
  - (h) documentation of efforts made to assist the LBE firms contacted that needed assistance in obtaining required insurance.

(E) Unless otherwise waived by the Commissioner with the approval of the Office of Economic and Financial Opportunity, failure of a proposed contractor to provide the information required by paragraphs (C) and (D) above may render the bid non-responsive and the Contract may not be awarded to the bidder. If the contractor states that it will subcontract a specific portion of the work, but can demonstrate despite good faith efforts it cannot achieve its required LBE percentage for subcontracted work until after award of Contract, the Contract may be awarded, subject to a letter of compliance from the contractor stating that it will comply with Administrative Code Section 6-108.1 and subject to approval by the Commissioner. If the contractor has not met its required LBE percentage prior to award, the contractor shall demonstrate that a good faith effort has been made subsequent to award to obtain LBEs on each subcontract until it meets the required percentage.

(F) When a bidder indicates prior to award that no work will be subcontracted, no work may be subcontracted without the prior written approval of the Commissioner, which shall be granted only if the contractor in good faith seeks LBE subcontractors at least six weeks prior to the start of work.

(G) The contractor may not substitute or change any LBE which was identified prior to award of the contract without the written permission of the Commissioner. The contractor shall make a written application to the Commissioner for permission to make such substitution or change, explaining why the contractor needs to change its LBE subcontractor and how the contractor will meet its LBE subcontracting requirement. Copies of such application must be served on the originally identified LBE by certified mail return receipt requested, as well as the proposed substitute LBE. The Commissioner shall determine whether or not to grant the contractor's request for substitution.

38. Bid Submission Requirements

The Bid Submission Requirements are set forth on page 2 of the Bid Booklet.

39. Comptroller's Certificate

This Contract shall not be binding or of any force unless it is registered by the Comptroller in accordance with Section 328 of the City Charter and the Procurement Policy Board Rules. This Contract shall continue in force only after annual appropriation of funds by the City of New York and certification as hereinabove set forth.

40. Procurement Policy Board Rules

This Invitation For Bids is subject to the Rules of the Procurement Policy Board of the City of New York. In the event of a conflict between said Rules and a provision of this Invitation For Bids, the Rules shall take precedence.

41. DDC Safety Requirements

The DDC Safety Requirements apply to the work to be performed pursuant to the Contract. The DDC Safety Requirements are set forth on the following pages.

**CITY OF NEW YORK**  
**DEPARTMENT OF DESIGN AND CONSTRUCTION**  
**SAFETY REQUIREMENTS**

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**THE DDC SAFETY REQUIREMENTS INCLUDE THE FOLLOWING SECTIONS:**

- I. POLICY ON SITE SAFETY**
- II. PURPOSE**
- III. DEFINITIONS**
- IV. RESPONSIBILITIES**
- V. SAFETY QUESTIONNAIRE**
- VI. SAFETY PROGRAM AND SITE SAFETY PLAN**
- VII. KICK-OFF/PRE-CONSTRUCTION MEETINGS AND SAFETY REVIEW**
- VIII. EVALUATION DURING WORK IN PROGRESS**
- IX. SAFETY PERFORMANCE EVALUATION**

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## I. POLICY ON SITE SAFETY

The City of New York Department of Design and Construction (DDC) is committed to a policy of injury and illness prevention and risk management for construction work that will ensure the safety and health of the workers engaged in the projects and the protection of the general public. Therefore, it is DDC's policy that work carried out by Contractors on DDC jobsites must, at a minimum, comply with applicable federal, state and city laws, rules and regulations, including without limitation:

- ☐ U. S. Department of Labor 29 Code of Federal Regulations (CFR) Part 1926 and applicable Sub-parts of Part 1910 – U.S. Occupational Safety and Health Administration (OSHA) including, but not limited to "Respiratory Protection" (29 CFR 1910.134), "Permit-Required Confined Spaces" (29 CFR 1910.146), and "Hazard Communication" (29 CFR 1910.1200);
- ☐ New York State Department of Labor Industrial Code Rule 23 – Protection in Construction, Demolition and Excavation;
- ☐ New York City Construction Codes, Title 28
- ☐ NYC Department of Transportation Title 34 Chapter 2 – Highway Rules
- ☐ New York State Department of Labor Industrial Code Rule 753
- ☐ NYC Local Law No. 113 (2005) Noise Control Code

In addition, all regulations promulgated by the NYC Department of Transportation, including requirements for Maintenance and Protection of Traffic (MPT), are applicable when contained in contract specifications. While MPT is a significant component of work in our Infrastructure Division, it does not supersede or exempt Contractors from complying with other applicable health and safety standards (for example, excavating and trenching standards, operation of heavy equipment and compliance with City environmental and noise regulations).

## I. PURPOSE

The purpose of this policy is to ensure that Contractors perform their work and supervise their employees in accordance with all applicable federal, state and city rules and regulations. Further, Contractors will be expected to minimize or eliminate jobsite and public hazard, through a planning, inspection, auditing and corrective action process. The goal is to control risks so that injuries, illnesses and accidents to contractors' employees, DDC employees and the general public, as well as damage to city-owned and private property, are reduced to the lowest level feasible.

## III. DEFINITIONS

**Agency Chief Contracting Officer (ACCO):** The ACCO shall mean the person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO.

**Competent Person:** As defined by OSHA, an individual who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees or the general public, and who has authorization to take prompt corrective measures to eliminate them.

**Construction Safety Auditor:** A representative of the QACS Construction Safety Unit who provides inspection and assessment services to enhance health and safety on all DDC construction projects. The activities of the Construction Safety Auditor include performing site surveys, reviewing health and safety plans, reviewing construction permits, and rendering technical advice and assistance to DDC Resident Engineers and Project Managers.

**Construction Safety Unit:** A part of QACS within the Division of Technical Support that assesses contractor safety on DDC jobsites and advises responsible parties of needed corrective actions.

**Construction Superintendent:** A representative of the contractor responsible for overseeing performance of the required construction work. This individual must engage in sound construction practices, and is responsible to maintain a safe work site. In the case of a project involving the demolition, alteration or new construction of buildings, the Construction Superintendent must be licensed by the NYC Department of Buildings.

**Contractor:** For purposes of these Safety Requirements, the term "Contractor" shall mean any person or entity that enters into a contract for the performance of construction work on a DDC project. The term "Contractor" shall include any person or entity which enters into any of the following types of contracts: (1) a prime construction contract for a specific project, (2) a prime construction contract using the Job Order Contracting System ("JOCS Contract"), and (3) a subcontract with a CM/Builder ("First Tier Subcontract").

**Director - Quality Assurance and Construction Safety (QACS):** Responsible for the operations of the QACS Construction Safety Unit and the DDC Site Safety management programs.

**Job Hazard Assessment (JHA):** A process of identifying site-specific hazards that may be present during construction and establishing the means and methods to reduce or eliminate those hazards.

**Jobsite Safety Coordinator:** A person designated by the Contractor to be onsite during all activities. This individual shall have received, at a minimum, the OSHA 10-hour construction safety program. Other examples of acceptable training are the 30-hour OSHA Safety and Health Standards for the Construction Industry training program (OSHA 510) or a degree/certificate in a safety and health from a college-level curriculum. This person does not necessarily have to be dedicated full-time to site safety, but must have sufficient experience and authority to undertake corrective action and must qualify to be a competent person. For certain projects, as defined in NYC Construction Codes - Title 28, this person may be required to have a Site Safety Manager's License issued by the NYC DOB.

**Qualified Person:** As defined by OSHA, an individual who, by possession of a recognized degree, certificate, license or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve problems relating to the subject matter, the work, or the project. Qualified Persons are required under regulation to address issues pertaining, but without limit, to fall protection, scaffold design and trenching and shoring, among others.

**Resident Engineer (RE) / Construction Project Manager (CPM):** Representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the work. (The RE/CPM may be a third-party consultant, including a CM, retained by DDC.)

**Safety Program:** Established by the Contractor that covers all operations of that Contractor and establishes the Contractor's overall safety policy, regulatory compliance plan and minimum safety standards. The Safety Program must be submitted prior to the commencement of work at the site and is subject to review and acceptance by the Construction Safety Unit.

**Safety Questionnaire:** Used by DDC to evaluate Contractor's current and past safety performance. It is required to be completed by all Contractors initially when submitting bids for Construction work, or when being pre-qualified and updated annually or as requested by the DDC.

**Site Safety Plan:** A site-specific safety plan developed by the Contractor for a specific project. The Site Safety Plan must identify hazards associated with the project, and include specific safety precautions and training appropriate and necessary to complete the work. The Site Safety Plan must be submitted prior to the commencement of work at the site and is subject to review and acceptance by the Construction Safety Unit.

**Unsafe or Unhealthy Condition:** A condition that could be potentially hazardous to the health and safety of personnel or the public, and/or damaging to equipment, machinery, property or the environment.

**Weekly Safety Meetings:** Weekly documented jobsite safety meetings, given to all jobsite personnel by contractor, with the purpose of discussing general safety topics and job specific requirements encountered at the DDC work site.



#### **IV. RESPONSIBILITIES**

All persons who manage, perform, and provide support for construction projects shall conduct operations in compliance with the requirements identified in this Policy and all applicable governing regulatory agency requirements and guidelines pertaining to safety in construction.

##### **A. Resident Engineer / Construction Project Manager / Construction Manager**

- Monitors the issuance of safety-related permits, approvals and drawings and maintains copies on site.
- Monitors construction-related work activities to confirm that they are conducted in accordance with DDC policies and all applicable regulations that pertain to construction safety.
- Maintains documentation and periodically attends weekly safety meeting.
- Notifies the Construction Safety Unit and the ACCO's Insurance and Risk Management Unit of project-related accidents and emergencies, as per DDC's Construction Safety Emergency Protocol.
- Gathers facts related to all accidents and prepares DDC Accident Reports.
- Notifies the Construction Safety Unit of outside regulatory agency inspections and forwards a copy of the inspection report within three days of its receipt.
- Monitors the conditions at the site for conformance with the Site Safety Plan and DDC construction documents.
- Notifies the contractor and DDC in the event that any condition or activity exists that is not in compliance with the Site Safety Plan, applicable federal, state or local codes or any condition that presents a potential risk of injury to the public or workers or possible damage to property.
- Notifies DDC of any emergency condition and directs the contractor to provide such labor, materials, equipment and supervision to abate such conditions.
- Reports gross safety violations to the Construction Safety Unit immediately.

##### **A. Contractors**

- Complete a Safety Questionnaire and submit with its bid or as part of a pre-qualification package.
- Provide a Written Job Hazard Assessment (JHA) that identifies expected safety issues of the work to be performed. JHA shall be included with the Site Safety Plan submitted by the contractor.
- Submit a Site Safety Plan and Safety Program within 15 days of issuance of the Notice to Proceed, or as otherwise directed. The Site Safety Plan and Safety Program are subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. The Site Safety Plan shall be revised and updated as necessary.
- Ensure that all employees are aware of the hazards associated with the project through formal and informal training and/or other communications. Conduct and document weekly safety meetings for the duration of the project. Documentation to be provided to the RE/CPM/CM on a monthly basis.
- Name a Construction Superintendent, if required.
- Name a Job Site Safety Coordinator. The Contractor will be required to identify the Job Site Safety Coordinator in the Site Safety Plan.
- Comply with all mandated federal, state and local safety and health rules and regulations.
- Comply with all provisions of the Site Safety Plan.
- As part of the Site Safety Plan, prepare a site specific MPT (if not otherwise provided in the contract documents) and comply with all of its provisions.
- Conduct and document site-specific safety orientation for Contractor personnel to review the hazards associated with the project as identified in the Site Safety Plan and the specific safety procedures and controls that will be used to protect workers, the general public and property. The Job Site Safety Coordinator will conduct this training prior to mobilization and provide documentation to the RE/CPM/CM.
- Provide, replace and adequately maintain at or around the project site, suitable and sufficient signage, lights, barricades and enclosures (fences, sidewalk sheds, netting, bracing, etc.).
- Report unsafe conditions or hazards to the DDC RE/CPM/CM as soon as practical, but no more than 24 hours after discovery, and take action to remove or abate such conditions.

- Report any accident involving injuries to workers or the general public, as well as property damage, to the DDC RE/CPM/CM within two (2) hours.
- Notify the DDC RE/CPM/CM within two (2) hours of the start of an inspection by any regulatory agency personnel, including OSHA.
- Maintain all records pertaining to all required compliance documents and accident and injury reports.
- Respond to DDC recommendations on safety, which shall in no way relieve the Contractor of its responsibilities for safety on the project. The Contractor has sole responsibility for safety.

## V. SAFETY QUESTIONNAIRE

DDC requires that all Contractors provide information regarding their current and past safety and environmental performance and programs. This will be accomplished by the use of the DDC Safety Questionnaire. As a part of the bid submittal package, the contractor must submit a completed DDC Safety Questionnaire listing their workers' compensation experience modification rating and OSHA Incidence Rates for the three (3) years prior to the date of the bid opening. DDC may request a Contractor to update its Questionnaire at any time or to provide more detailed information. The Contractor must provide the requested update within 30 days.

The following criteria will be used by DDC in reviewing the Contractor's responsibility, which will be based on the information provided on the questionnaire:

- Criteria 1: OSHA Injury and Illness Rates (I&IR) are no greater than the average for the industry (based on the most current Bureau of Labor Statistics data for the Contractors SIC code); and
- Criteria 2: Insurance workers compensation Experience Modification Rate (EMR) equal to or less than 1.0; and
- Criteria 3: Any willful violations issued by OSHA or NYC DOB within the last three years; and
- Criteria 4: A fatality (worker or member of public) experienced on or near Contractor's worksite within the last three (3) years; and
- Criteria 5: An unacceptable rating by QACS based on past performance on DDC projects; and
- Criteria 6: Contractor has in place an acceptable corporate safety program and its employees shall have completed all documented relative safety training; and
- Criteria 7: Contractor shall provide OSHA Injury Records (currently OSHA 300 Log) for the last three (3) years.

If the Contractor fails to meet the basic criteria listed above, the Construction Safety Unit may request, through the ACCO, more detail concerning the Contractor's safety experience. DDC may request the Contractor to provide copies of, among other things, OSHA records, OSHA and DOB citations, EPA citations and written Safety Programs.

## VI. SAFETY PROGRAM AND SITE SAFETY PLAN

Within fifteen (15) days of issuance of the Notice to Proceed, or as otherwise directed, the Contractor shall submit the following: (1) Safety Program, and (2) Site Safety Plan. The Safety Program shall set forth the Contractor's overall safety policy, regulatory compliance plan and minimum safety standard, and the Site Safety Plan shall identify hazards associated with the project, and include specific safety precautions and training appropriate and necessary to complete the work. The Safety Program and the Site Safety Plan are subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. Failure by the contractor to submit an acceptable Site Safety Plan and Safety Program shall be grounds for default.

The Site Safety Plan shall apply to all Contractor and subcontractor operations, and shall have at a minimum, the following elements. Each element shall be described in a separate section in the written document. It may be necessary to modify the basic format for certain unique or high-risk projects (such as tunnels or high-rise construction). The basic elements are as follows:

1. **Responsibility and Organization:** Identify the person or persons with authority and responsibility for implementing the Site Safety Plan. Provide an organization chart and define levels of authority and responsibility. Identify the Competent Person, the Construction Superintendent (if required), the Job Safety Coordinator and the Qualified Person required for this project.
2. **Communication:** Establish a system for communicating with employees and subcontractors on matters relating to worker and public safety and health and environmental protection, including provisions designed to encourage employees to inform the employer of hazards at the worksite without fear of reprisal. An emergency response notification protocol is to be established that also includes after hours contact numbers. The plan must also include provisions for weekly safety meetings held by the Job Site Safety Coordinator.
3. **Job Hazard Assessment:** A written document submitted by the contractor, used to identify expected job hazards and public safety risks and state the specific means and methods to reduce, control or eliminate those hazards. This part of the Site Safety Plan must also include how on-going evaluations of those risks and hazards will be carried out, including plans for periodic inspections to identify unsafe conditions, work practices and public safety hazards.
4. **Accident/Exposure Investigation:** Establish a procedure to investigate and report occupational and public injury or illness, property damage, vehicle accidents or other mishaps.
5. **Hazard Correction:** Establish means, methods and/or procedures for correcting unsafe or unhealthy conditions that might be exposing both the public and workers to hazards. Corrective actions must be taken immediately when observed or discovered. Should an imminent hazard exist which cannot be immediately abated without endangering employees, the public and/or property, remove or restrict all exposed persons from the area except those necessary to correct the existing condition. Employees necessary to correct the hazardous condition shall be provided the necessary safeguards. When corrective actions cannot be taken immediately, temporary measures should be taken until such time permanent measures are taken to eliminate the potential risks or hazards.
6. **Training:** Describe site-specific hazard training programs. In addition to the required safety orientation, additional site specific training, in the form of required weekly safety meetings, will be required. Contractors must also initiate training when: a) new employees are hired; b) employees are given new job assignments for which training has not been previously received; c) new substances, processes, procedures or equipment are introduced that might represent a new public or worker hazard; d) the employee is made aware of a new or previously unrecognized hazard; e) new supervisors are assigned to familiarize themselves with the safety and health hazards to which employees under their immediate direction and control may be exposed; and f) after a jobsite incident or accident has occurred.
7. **Recordkeeping:** Establish procedures to maintain records of scheduled and periodic inspections, weekly safety meetings, and training records. Updated records shall be maintained at the jobsite, accessible to the Construction Safety Auditors and/or Quality Assurance Auditors/RE/CPM, and retained in accordance with DDC policy.

The most critical component of the Site Safety Plan is the Job Hazard Assessment section. This section must address specific hazards that are anticipated throughout the project. Each Site Safety Plan must address, at a minimum:

- Public and pedestrian safety
- Fall protection
- Electrical hazards
- Scaffolding
- Fire protection
- Emergency notification & response
- Housekeeping / debris removal
- Dust control
- Maintenance and protection of traffic
- Trenching and excavating
- Heavy equipment operations
- Material / equipment storage
- Environmental contamination
- Sheeting and shoring
- Alcohol and Drug Abuse Policy

The following additional hazards must be addressed, if applicable, based on the contract safety specifications and/or the results of the JHA (the list is not all-inclusive):

- Basic Personal Protective Equipment
- Compressed Air
- Compressed Gas Cylinders
- Cranes, Derricks and Hoists
- Demolition
- Electrical safety
- Excavations and Trenching
- Fall Protection – Floor openings/Stairways
- Fall Protection – Guardrails Toe boards etc
- Fall Protection – Leading Edge
- Fall Protection – Personal Fall Protection Devices
- Fire Protection and Fire Prevention
- Hazard Communication (RIGHT TO KNOW)
- Hazardous Energy & Lock Out / Tag Out
- Housekeeping/ Sanitation
- Maintenance and Protection of Traffic (MPT)
- Man Lifts /Aerial Lifts
- Marine Operations
- Motor Vehicle Safety
- Overhead Power lines
- Permit Required Confined Space
- Portable Ladders
- Powered Actuated Tools
- Powered Material Handling Equipment
- Scaffolds – Mobile
- Scaffolds – Stationary
- Scaffolds – Suspended
- Slings
- Steel Erection
- Welding and Cutting (Hot Work)
- Airborne Contaminants – Particulates – General
- Asbestos
- Blood borne Pathogens
- Hearing Protection
- Lead in Construction
- Mercury in Construction
- PCB's
- Respiratory Protection
- Silica
- Thermal Stress
- West Nile Virus
- Rodents and Vermin
- Noise Mitigation Plan

Certain DDC programs, such as Job Order Contracting System (JOCS), may not necessarily require Site Safety Plans. The JOCS contractor will be required to submit a Safety Program. In addition, certain DDC Operating Units may establish program or client-specific safety requirements. The contractor's Site Safety Plan must address such program or client specific safety requirements.

## **VII. KICK-OFF MEETINGS/PRE-CONSTRUCTION AND SAFETY REVIEW**

As part of the construction kick-off meeting, a Site Safety Plan review will be part of the agenda. A QACS representative will participate in this meeting with the contractor prior to the start of the project for the purpose of:

- A. Reviewing the safety issues detailed in the contract.
- B. Reviewing the Site Safety Plan.
- C. Reviewing any new issues or information that was not previously addressed.
- D. Discussing planned inspections and audits of the site by DDC personnel.

## **VIII. EVALUATION DURING WORK IN PROGRESS**

The Contractor's adherence to these Safety Requirements will be monitored throughout the project. This will be accomplished by the following:

- A. Use of a safety checklist by a representative of the Construction Safety Unit or other designated DDC representative or Consultant during regular, unannounced inspections of the job site. Field Exit Conferences will be held with the RE/CPM, Contractor Superintendents or Safety Representatives.
- B. The RE/CPM will continually monitor the safety and environmental performance of the contractor's employees and work methods. Deficiencies shall be brought to the attention of the contractor's representative on site for immediate correction. The DDC representative will maintain a written record of these deficiencies and forward them to the Construction Safety Unit on a weekly basis. Any critical deficiencies shall be immediately reported to QACS phone# (718) 391-1624 or (718) 391-1911.
- C. If the Contractor's safety performance during the project is not up to DDC standards (safety performance measure, accident/incident rate, etc.) the Director- QACS, or designee will meet with the Contractor's safety representative, the DDC project manager, the RE/CPM, or the DDC Environmental Specialist (if environmental issues are involved). The purpose of this meeting is to 1) determine the level of non-compliance; 2) explain and clarify the safety/environmental provisions; 3) agree on a future course of action to correct the deficiencies.
- D. If the deficiencies continue to occur with inadequate attention by the contractor, this shall, among other remedies available, be grounds for default.
- E. The contractor shall inform the Construction Safety Unit and ACCO Insurance and Risk Management Unit of all medical injuries or illnesses that require doctors' treatment resulting from an on-the-job incident within 24 hours of the occurrence. The Construction Safety Unit shall also be immediately informed of all fatalities, catastrophic accidents with more than one employee hospitalized, any injuries to members of the general public and major equipment damage (e.g., property damage, equipment rollovers, loads dropped from crane). QACS shall maintain a record of all contractor injuries and illnesses during the project and provide regular reports to the Agency.
- F. The Construction Safety Unit shall be immediately notified at the start of any NYS-DOL/ NYC-COSH/ OSHA/ EPA inspections. The Director of Quality Assurance & Construction Safety shall maintain a log of all contractor OSHA/EPA inspections and citations during the project.

## **IX. SAFETY PERFORMANCE EVALUATION**

The contractor's safety record, including all DDC inspection results, will be considered as part of the Contractor's performance evaluation at the conclusion of the project. Poor safety performance during the course of the project shall be a reason to rate a Contractor unsatisfactory which will be reflected in the City's Vendex system and will be considered for future procurement actions as set forth in the City's Procurement Policy Board Rules.

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**CITY OF NEW YORK**  
**STANDARD CONSTRUCTION CONTRACT**  
**DELAY DAMAGES PILOT**

**September 2008**





**CITY OF NEW YORK  
STANDARD CONSTRUCTION CONTRACT**

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CITY OF NEW YORK

STANDARD CONSTRUCTION CONTRACT (September 2008)

The Standard Construction Contract dated September 2008 (the "Contract") is amended as set forth below.

- Article 77: Article 77, Part A, Section 5 is deleted in its entirety and replaced with the following:

5. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5), [i.e., a contract valued at or below \$3M (for projects in New York City) or a contract that is subject to a Project Labor Agreement] where the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades [i.e., plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring], the Contractor must identify all those to which it intends to award construction subcontracts for any of the Wicks trades, regardless of what point in the life of the contract such subcontracts will occur, at the time of bid submission. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.**

- Article 77: Article 77, Part A, Section 11 is deleted in its entirety and replaced with the following:

11. **Modification of Subcontractor Utilization Plan.** A Contractor may request a modification of its Subcontractor Utilization Plan (Subcontractor Participation Goals) after award of this Contract. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5), [i.e., a contract valued at or below \$3M (for projects in New York City) or a contract that is subject to a Project Labor Agreement] where the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades [i.e., plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring], the Contractor may request a Modification of its Subcontractor Utilization Plan as part of its bid submission. The Agency may grant a request for Modification of a Contractor's Subcontractor Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Subcontractor Participation Goals. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:**

Sub-paragraphs (a) through (h) remain unchanged.

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**WITNESSETH:**

The parties in consideration of the mutual agreements contained herein, agree as follows:

**CHAPTER I  
THE CONTRACT AND DEFINITIONS**

**ARTICLE 1. THE CONTRACT**

1.1 Except for titles, subtitles, headings, running headlines, tables of content and indices (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of this Contract:

1.1.1 All provisions required by law to be inserted in this Contract, whether actually inserted or not;

1.1.2 The Contract Drawings and Specifications;

1.1.3 The General Conditions and Special Conditions, if any;

1.1.4 The Contract;

1.1.5 The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet;

1.1.6 The Budget Director's Certificate; all Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed with the Work.

1.2 Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated the most expensive way of doing the Work, unless the Contractor shall have asked for and obtained a decision in writing from the Commissioner, of the Agency that is entering into this Contract, before the submission of its bid as to what shall govern.

**ARTICLE 2. DEFINITIONS**

2.1 The following words and expressions, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

2.1.1 "Addendum" or "Addenda" shall mean the additional Contract provisions issued in writing by the Commissioner prior to the receipt of bids.

2.1.2 "Agency" shall mean a city, county, borough or other office, position, department, division, bureau, board or commission, or a corporation, institution or agency of government, the expenses of which are paid in whole or in part from the City treasury.

2.1.3 "Agency Chief Contracting Officer" (ACCO) shall mean a person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO.

2.1.4 "City" shall mean the City of New York.

2.1.5 **"City Chief Procurement Officer" (CCPO)** shall mean a person delegated authority by the Mayor to coordinate and oversee the procurement activity of Mayoral agency staff, including the ACCO and any offices which have oversight responsibility for the procurement of construction.

2.1.6 **"Commissioner"** shall mean the head of the Agency that has entered into this Contract, or his/her duly authorized representative.

2.1.7 **"Comptroller"** shall mean the Comptroller of the City of New York.

2.1.8 **"Contract" or "Contract Documents"** shall mean each of the various parts of the contract referred to in Article 1 hereof, both as a whole and severally.

2.1.9 **"Contract Drawings"** shall mean only those drawings specifically entitled as such and listed in the Specifications or in any Addendum, or any drawings furnished by the Commissioner, pertaining or supplemental thereto.

2.1.10 **"Contract Work"** shall mean everything required to be furnished and done by the Contractor by any one or more of the parts of the Contract referred to in Article 1, except Extra Work as hereinafter defined.

2.1.11 **"Contractor"** shall mean the entity which executed this Contract, whether a corporation, firm, partnership, joint venture, individual, or any combination thereof, and it(s), their, his/ her successors, personal representatives, executors, administrators and assigns, and any person, firm, partnership, joint venture, individual, or corporation which shall at any time be substituted in the place of the Contractor under this Contract.

2.1.12 **"Days"** shall mean calendar days, except where otherwise specified.

2.1.13 **"Engineer" or "Architect" or "Project Manager"** shall mean the person so designated in writing by the Commissioner to act as such in relation to this Contract, including a private Architect or Engineer or Project Manager, as the case may be.

2.1.14 **"Engineering Audit Officer" (EAO)** shall mean the person so designated by the Commissioner to perform responsible auditing functions hereunder.

2.1.15 **"Extra Work"** shall mean Work other than that required by the Contract at the time of award which is authorized by the Commissioner pursuant to Chapter VI of this Contract.

2.1.16 **"Federal-Aid Contract"** shall mean a contract in which the United States (federal) Government provides financial funding as so designated in the Information for Bidders.

2.1.17 **"Final Acceptance"** shall mean final written acceptance of all the Work by the Commissioner, a copy of which shall be sent to the Contractor.

2.1.18 **"Final Approved Punch List"** shall mean a list, approved in writing by the Engineer, specifying those items of Work to be completed by the Contractor after Substantial Completion and dates for the completion of each item of Work.

2.1.19 **"Law" or "Laws"** shall mean the Constitution of the State of New York, the New York City Charter, the New York City Administrative Code, a Statute of the United States or



of the State of New York, a local law of the City of New York, any ordinance, rule or regulation having the force of law, or common law.

2.1.20 **"Materialman"** shall mean any corporation, firm, partnership, joint venture, or individual, other than employees of the Contractor, who or which contracts with the Contractor or any Subcontractor, to fabricate or deliver, or who actually fabricates or delivers, plant, materials or equipment to be incorporated in the Work.

2.1.21 **"Means and Methods of Construction"** shall mean the labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by this Contract.

2.1.22 **"Other Contractor(s)"** shall mean any Contractor (other than the entity which executed this Contract or its Subcontractors) who has a contract with the City for work on or adjacent to the building or site of the Work.

2.1.23 **"Payroll Taxes"** shall mean State Unemployment Insurance ("SUI"), Federal Unemployment Insurance (FUI) and payments pursuant to the Federal Insurance Contributions Act ("FICA").

2.1.24 **"Project"** shall mean the public improvement to which this Contract relates.

2.1.25 **"Procurement Policy Board" (PPB)** shall mean the Agency of the City of New York whose function is to establish comprehensive and consistent procurement policies and rules which shall have broad application throughout the City.

2.1.26 **"Required Quantity"** in a unit price Contract shall mean the actual quantity of any item of Work or materials which is required to be performed or furnished in order to comply with the Contract.

2.1.27 **"Resident Engineer"** shall mean the representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the Work.

2.1.28 **"Site"** shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

2.1.29 **"Specifications"** shall mean all of the directions, requirements and standards of performance applying to the Work as hereinafter detailed and designated under the Specifications.

2.1.30 **"Subcontractor"** shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor or with its Subcontractors to furnish, or actually furnishes labor, or labor and materials, or labor and equipment, at the site. Wherever the word Subcontractor appears, it shall also mean Sub-Subcontractor.

2.1.31 **"Substantial Completion"** shall mean the written determination by the Commissioner that the Work required under this Contract is substantially, but not entirely, complete.

2.1.32 **"Treasurer"** shall mean the Commissioner of the Department of Finance of the City of New York.

2.1.33 **"Work"** shall mean all services required to complete the Project in accordance with the Contract Documents, including without limitation, labor, material, superintendence, management, administration, equipment, and incidentals, and shall include both Contract Work and Extra Work.

## **CHAPTER II THE WORK AND ITS PERFORMANCE**

### **ARTICLE 3. CHARACTER OF THE WORK**

3.1 Unless otherwise expressly provided in the **Contract Drawings, Specifications and Addenda**, the **Work** shall be performed in accordance with the best modern practice, utilizing, unless otherwise specified in writing, new and unused materials of standard first grade quality and workmanship and design of the highest quality, to the satisfaction of the **Commissioner**.

### **ARTICLE 4. MEANS AND METHODS OF CONSTRUCTION**

4.1 Unless otherwise expressly provided in the **Contract Drawings, Specifications and Addenda**, the **Means and Methods of Construction** shall be such as the **Contractor** may choose; subject, however, to the **Engineer's** right to reject the **Means and Methods of Construction** proposed by the **Contractor** which in the opinion of the **Engineer**:

- 4.1.1 Will constitute or create a hazard to the **Work**, or to persons or property; or
- 4.1.2 Will not produce finished **Work** in accordance with the terms of the **Contract**; or
- 4.1.3 Will be detrimental to the overall progress of the **Project**.

4.2 The **Engineer's** approval of the **Contractor's Means and Methods of Construction**, or his/her failure to exercise his/her right to reject such means or methods, shall not relieve the **Contractor** of its obligation to complete the **Work** as provided in this **Contract**; nor shall the exercise of such right to reject create a cause of action for damages.

### **ARTICLE 5. COMPLIANCE WITH LAWS**

5.1 The **Contractor** shall comply with all **Laws** applicable to this **Contract** and to the **Work** to be done hereunder.

5.2 **Procurement Policy Board Rules**: This **Contract** is subject to the Rules of the **PPB** ("**PPB Rules**") in effect at the time of the bid opening for this **Contract**. In the event of a conflict between the **PPB Rules** and a provision of this **Contract**, the **PPB Rules** shall take precedence.

5.3 **Noise control code provisions**.

5.3.1 In accordance with the provisions of Section 24-216(b) of the Administrative Code of the City ("**Administrative Code**"), Noise Abatement Contract Compliance, devices and activities which will be operated, conducted, constructed or manufactured pursuant to this **Contract** and which are subject to the provisions of the **City Noise Control Code** shall be operated, conducted, constructed, or manufactured without causing a violation of the **Administrative Code**. Such devices and activities shall incorporate advances in the art of noise control development for the kind and level of noise

emitted or produced by such devices and activities, in accordance with regulations issued by the **Commissioner** of the Department of Environmental Protection.

5.3.2 The Contractor agrees to comply with Section 24-219 of the Administrative Code of the City ("Administrative Code") and implementing rules codified at 15 Rules of the City of New York ("RCNY") Section 28-100 et. seq. In accordance with such provisions, the **Contractor**, if the Contractor is the responsible party under such regulations, shall prepare and post a Construction Noise Mitigation Plan at each work site, in which the **Contractor** shall certify that all construction tools and equipment have been maintained so that they operate at normal manufacturers' operating specifications. If the **Contractor** cannot make this certification, it must have in place an Alternative Noise Mitigation Plan approved by the New York City Department of Environmental Protection. In addition, the Contractor's certified Construction Noise Mitigation Plan is subject inspection by the Department of Environmental Protection in accordance with 15 RCNY §28-101. No Contract work may take place at a worksite unless there is a Construction Noise Mitigation Plan or approved Alternative Noise Mitigation Plan in place. In addition, the **Contractor** shall create and implement a noise mitigation training program. Failure to comply with these requirements may result in fines and other penalties pursuant to the applicable provisions of the Administrative Code and RCNY.

5.4 Ultra Low Sulfur Diesel Fuel: In accordance with the provisions of Section 24-163.3 of the Administrative Code, the Contractor specifically agrees as follows:

5.4.1 Definitions. For purposes of this Article 5.4, the following definitions apply:

5.4.1(a) "Contractor" means any person or entity that enters into a Public Works Contract with a City agency, or any person or entity that enters into an agreement with such person or entity, to perform work or provide labor or services related to such Public Works Contract

5.4.1(b) "Motor Vehicle" means any self-propelled vehicle designed for transporting persons or property on a street or highway.

5.4.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under section 7411 or section 7521 of title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.4.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers and similar equipment, except that this term shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five horsepower or less and that are not used in any construction program or project.

5.4.1(e) "Public Works Contract" means a contract with a City agency for a construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; a contract with a City agency for the preparation for any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; or a contract with a City agency for any final work involved in the completion of any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge.

5.4.1(f) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million.

#### 5.4.2 Ultra Low Sulfur Diesel Fuel

5.4.2(a) All Contractors shall use Ultra Low Sulfur Diesel Fuel in diesel-powered Nonroad Vehicles in the performance of this **Contract**.

5.4.2(b) Notwithstanding the requirements of Article 5.4.2(a), Contractors may use diesel fuel that has a sulfur content of no more than thirty parts per million to fulfill the requirements of this Article 5.4.2, where the Commissioner of the New York City Department of Environmental Protection ("DEP Commissioner") has issued a determination that a sufficient quantity of Ultra Low Sulfur Diesel Fuel is not available to meet the needs of City agencies and Contractors. Any such determination shall expire after six months unless renewed.

5.4.2(c) Contractors shall not be required to comply with this Article 5.4.2 where the agency letting this contract makes a written finding, which is approved, in writing, by the DEP Commissioner, that a sufficient quantity of Ultra Low Sulfur Diesel Fuel, or diesel fuel that has a sulfur content of no more than thirty parts per million is not available to meet the requirements of Section 24-163.3 of the Administrative Code, provided that such Contractor in its fulfillment of the requirements of this **Contract**, to the extent practicable, shall use whatever quantity of Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million is available. Any finding made pursuant to this subdivision shall expire after sixty days, at which time the requirements of this Article 5.4.2 shall be in full force and effect unless the Agency renews the finding in writing and such renewal is approved by the DEP Commissioner.

5.4.2(d) Contractors may check on determinations and approvals issued by the DEP Commissioner pursuant to Section 24-163.3 of the Administrative Code, if any, at [www.dep.nyc.gov](http://www.dep.nyc.gov) or by contacting the Agency issuing this solicitation.

5.4.2(e) The requirements of this Article 5.4.2 do not apply where they are precluded by federal or State funding requirements or where the **Contract** is an emergency procurement.

#### 5.4.3 Best Available Technology

5.4.3(a) All Contractors shall utilize the best available technology for reducing the emission of pollutants for diesel-powered Nonroad Vehicles in the performance of this **Contract**. For determinations of best available technology for each type of diesel-powered Nonroad Vehicle, Contractors shall comply with the regulations of the City Department of Environmental Protection, as and when adopted, Chapter 14 of Title 15 of the Rules of the City of New York (RCNY). The Contractor shall fully document all steps in the best available technology selection process and shall furnish such documentation to the Agency or the DEP Commissioner upon request. The Contractor shall retain all documentation generated in the best available technology selection process for as long as the selected best available technology is in use.

5.4.3(b) No Contractor shall be required to replace best available technology for reducing the emission of pollutants or other authorized technology utilized for a diesel-powered Nonroad Vehicle in accordance with the provisions of this Article 5.4.3 within three years of having first utilized such technology for such vehicle.

5.4.3(c) This Article 5.4.3 shall not apply to any vehicle used to satisfy the requirements of a specific Public Works Contract for fewer than twenty calendar days.

5.4.3(d) The Contractor shall not be required to comply with this Article 5.4.3 with respect to a diesel-powered Nonroad Vehicle under the following circumstances:

5.4.3(d)(1) Where the agency makes a written finding, which is approved, in writing, by the DEP Commissioner, that the best available technology for reducing the emission of pollutants as required by those paragraphs is unavailable for such vehicle, Contractor shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle.

5.4.3(d)(2) Where the DEP Commissioner has issued a written waiver based upon the Contractor having demonstrated to the DEP Commissioner that the use of the best available technology for reducing the emission of pollutants might endanger the operator of such vehicle or those working near such vehicle, due to engine malfunction, Contractor shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle, which would not endanger the operator of such vehicle or those working near such vehicle.

5.4.3(d)(3) In determining which technology to use for the purposes of Articles 5.4.3(d)(1) and 5.4.3(d)(2) above, Contractor shall primarily consider the reduction in emissions of particulate matter and secondarily consider the reduction in emissions of nitrogen oxides associated with the use of such technology, which shall in no event result in an increase in the emissions of either such pollutant.

5.4.3(d)(4) Contractors shall submit requests for a finding or a waiver pursuant to this Article 5.4.3(d) in writing to the DEP Commissioner, with a copy to the ACCO of the Agency issuing the solicitation. Any finding or waiver made or issued pursuant to Articles 5.4.3(d)(1) and 5.4.3(d)(2) above shall expire after one hundred eighty days, at which time the requirements of Article 5.4.3(a) shall be in full force and effect unless the Agency renews the finding, in writing, and the DEP Commissioner approves such finding, in writing, or the DEP Commissioner renews the waiver, in writing.

5.4.3(e) The requirements of this Article 5.4.3 do not apply where they are precluded by federal or State funding requirements or where the contract is an emergency procurement.

5.4.4 Section 24-163 of the Administrative Code. Contractors shall comply with Section 24-163 of the Administrative Code related to the idling of the engines of motor vehicles while parking.

#### 5.4.5 Compliance

5.4.5(a) Contractor's compliance with Article 5.4 may be independently monitored. If it is determined that the Contractor has failed to comply with any provision of Article 5.4, any costs associated with any independent monitoring incurred by the City shall be reimbursed by the Contractor.

5.4.5(b) Any Contractor who violates any provision of Article 5.4, except as provided in Article 5.4.5(c) below, shall be liable for a civil penalty between the amounts of one thousand and ten thousand dollars, in addition to twice the amount of money saved by such Contractor for failure to comply with Article 5.4.

5.4.5(c) No Contractor shall make a false claim with respect to the provisions of Article 5.4 to a City agency. Where a Contractor has been found to have done so, such Contractor shall be liable for a civil penalty of twenty thousand dollars, in addition to twice the amount of money saved by such Contractor in association with having made such false claim.

#### 5.4.6 Reporting

5.4.6(a) For all Public Works Contracts covered by this Article 5.4, the Contractor shall report to the Department the following information:

5.4.6(1) The total number of diesel-powered Nonroad Vehicles used to fulfill the requirements of this Public Works Contract;

5.4.6(2) The number of such Nonroad Vehicles that were powered by Ultra Low Sulfur Diesel Fuel;

5.4.6(3) The number of such Nonroad Vehicles that utilized the best available technology for reducing the emission of pollutants, including a breakdown by vehicle model and the type of technology;

5.4.6(4) The number of such Nonroad Vehicles that utilized such other authorized technology in accordance with Article 5.4.3, including a breakdown by vehicle model and the type of technology used for each such vehicle;

5.4.6(5) The locations where such Nonroad Vehicles were used; and

5.4.6(6) Where a determination is in effect pursuant to Article 5.4.2(b) or 5.4.2(c), detailed information concerning the Contractor's efforts to obtain Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million.

5.4.6(b) The Contractor shall submit the information required by Article 5.4.6(a) at the completion of work under the Public Works Contract and on a yearly basis no later than August 1 throughout the term of the Public Works Contract. The yearly report shall cover work performed the preceding fiscal year (July 1 - June 30).

5.5 Ultra Low Sulfur Diesel Fuel. In accordance with the Coordinated Construction Act for Lower Manhattan, as amended:

5.5.1 Definitions. For purposes of this Article 5.5, the following definitions apply:

5.5.1(a) "Lower Manhattan" means the area to the south of and within the following lines: a line beginning at a point where the United States pierhead line in the Hudson river as it exists now or may be extended would intersect with the southerly line of West Houston street in the borough of Manhattan extended, thence easterly along the southerly side of West Houston street to the southerly side of Houston street, thence easterly along the southerly side of Houston street to the southerly side of East Houston street, thence northeasterly along the southerly side of East Houston street to the point where it would intersect with the United States pierhead line in the East river as it exists now or may be extended, including tax lots within or immediately adjacent thereto.

5.5.1(b) "Lower Manhattan Redevelopment Project" means any project in Lower Manhattan that is funded in whole or in part with federal or State funding, or any project intended to improve transportation between Lower Manhattan and the two air terminals in the City of New York known as LaGuardia Airport and John F. Kennedy International Airport, or between Lower Manhattan and the air terminal in Newark known as Newark Liberty International Airport, and that is funded in whole or in part with federal funding.

5.5.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under section 7411 or section 7521 of title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.5.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers and similar equipment, except that this terms shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five horsepower or less and that are not used in any construction program or project.

5.5.1(e) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million.

5.5.2 Requirements. **Contractors** and **Subcontractors** are required to use only Ultra Low Sulfur Diesel Fuel to power the diesel-powered Nonroad Vehicles with engine horsepower (HP) rating of 50 HP and above used on a Lower Manhattan Redevelopment Project and, where practicable, to reduce the emission of pollutants by retrofitting such Nonroad Vehicles with oxidation catalysts, particulate filters, or technology that achieves lowest particulate matter emissions.

5.6 Pesticides. In accordance with Section 17-1209 of the Administrative Code, to the extent that the **Contractor** or any **Subcontractor** applies pesticides to any property owned or leased by the City, the **Contractor** and any **Subcontractor** shall comply with chapter 12 of the Administrative Code.

## ARTICLE 6. INSPECTION

6.1 During the progress of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall at all times afford the representatives of the City every reasonable, safe and proper facility for inspecting all **Work** done or being done at the **Site** and also for inspecting the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

6.2 The **Contractor's** obligation hereunder shall include the uncovering or taking down of finished **Work** and its restoration thereafter; provided, however, that the order to uncover, take down and restore shall be in writing, and further provided that if **Work** thus exposed proves satisfactory, and if the **Contractor** has complied with Article 6.1, such uncovering or taking down and restoration shall be considered an item of **Extra Work** to be paid for in accordance with the provisions of Article 26. If the **Work** thus exposed proves unsatisfactory, the City has no obligation to compensate the **Contractor** for the uncovering, taking down or restoration.

6.3 Inspection and approval by the **Commissioner**, the **Engineer**, **Project Manager**, or **Resident Engineer**, of finished **Work** or of **Work** being performed, or of materials and equipment at the place of manufacture or preparation, shall not relieve the **Contractor** of its obligation to perform the **Work** in strict accordance with the **Contract**. Finished or unfinished **Work** not found to be in strict accordance with the **Contract** shall be replaced as directed by the **Engineer**, even though such **Work** may have been previously approved and paid for. Such corrective work is **Contract Work** and shall not be deemed **Extra Work**.

6.4 Rejected **Work** and materials shall be promptly taken down and removed from the **Site**, which must at all times be kept in a reasonably clean and neat condition.

**ARTICLE 7. PROTECTION OF WORK AND OF PERSONS  
AND PROPERTY; NOTICES AND INDEMNIFICATION**

7.1 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall be under an absolute obligation to protect the finished and unfinished **Work** against any damage, loss, injury, theft and/or vandalism and in the event of such damage, loss, injury, theft and/or vandalism, it shall promptly replace and/or repair such **Work** at the **Contractor's** sole cost and expense, as directed by the **Resident Engineer**. The obligation to deliver finished **Work** in strict accordance with the **Contract** prior to **Final Acceptance** shall be absolute and shall not be affected by the **Resident Engineer's** approval of, or failure to prohibit, the **Means and Methods of Construction** used by the **Contractor**.

7.2 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall take all reasonable precautions to protect the persons and property of the **City** and of others from damage, loss or injury resulting from the **Contractor's**, and/or its **Subcontractors'** operations under this **Contract**. The **Contractor's** obligation to protect shall include the duty to provide, place or replace and adequately maintain at or about the **Site** suitable and sufficient protection such as lights, barricades, and enclosures.

7.3 The **Contractor** shall comply with the notification requirements set forth below in the event of any loss, damage or injury to **Work**, persons or property, or any accidents arising out of the operations of the **Contractor** and/or its **Subcontractors** under this **Contract**.

7.3.1 The **Contractor** shall make a full and complete report in writing to the **Resident Engineer** within three (3) **Days** after the occurrence.

7.3.2 The **Contractor** shall notify in writing the commercial general liability insurance carrier, and, where applicable, the worker's compensation and/or other insurance carrier, of any such loss, damage, injury, or accident, and any claim or suit arising therefrom, immediately, but not later than 20 days after such event. The **Contractor's** notice to the commercial general liability insurance carrier must expressly specify that "this notice is being given on behalf of the **City of New York** as Additional Insured as well as [the **Contractor**] as Named Insured." The **Contractor's** notice to the insurance carrier shall contain the following information: the name of the **Contractor**, the number of the **Contract**, the date of the occurrence, the location (street address and borough) of the occurrence, and the identity of the persons or things injured, damaged or lost.

7.3.2(a) At the time notice is provided to the insurance carrier(s), the **Contractor** shall provide copies of such notice to the **Comptroller** and the **Commissioner**. Notice to the **Comptroller** shall be sent to the Insurance Unit, NYC Comptroller's Office, 1 Centre Street – Room 1222, New York, New York, 10007. Notice to the **Commissioner** shall be sent to the address set forth in Schedule A of the General Conditions.

7.3.2(b) If the **Contractor** fails to provide any of the foregoing notices to any appropriate insurance carrier(s) in a timely and complete manner, the **Contractor** shall indemnify the **City** for all losses, judgments, settlements and expenses, including reasonable attorneys' fees, arising from an insurer's disclaimer of coverage citing late notice by or on behalf of the **City**.

7.4 To the fullest extent permitted by law, the **Contractor** shall indemnify, defend and hold the **City**, its employees and agents (the "Indemnitees") harmless against any and all claims (including but not limited to claims asserted by any employee of the **Contractor** and/or its **Subcontractors**) and costs and expenses of whatever kind (including but not limited to payment or reimbursement of attorneys' fees and disbursements) allegedly arising out of or in any way related to the operations of the **Contractor** and/or its **Subcontractors** in the performance of this **Contract** or from the **Contractor's** and/or its **Subcontractors'** failure to comply with any of the provisions of this **Contract** or of the **Law**. Such costs and expenses shall include all those incurred in defending the underlying claim and those incurred in connection with the enforcement of this Article 7.4 by way of cross-claim, third-party



claim, declaratory action or otherwise. The parties expressly agree that the indemnification obligation hereunder contemplates (1) full indemnity in the event of liability imposed against the Indemnitees without negligence and solely by reason of statute, operation of law or otherwise; and (2) partial indemnity in the event of any actual negligence on the part of the Indemnitees either causing or contributing to the underlying claim (in which case, indemnification will be limited to any liability imposed over and above that percentage attributable to actual fault whether by statute, by operation of law, or otherwise). Where partial indemnity is provided hereunder, all costs and expenses shall be indemnified on a pro rata basis.

7.4.1 Indemnification under Article 7.4 or any other provision of the **Contract** shall operate whether or not **Contractor** or its **Subcontractors** have placed and maintained the insurance specified under Article 22.

7.5 The **Contractor** waives all rights against the **City** for any damages or losses for which either is covered under any insurance required under Article 22 (whether or not such insurance is actually procured) or any other insurance applicable to the operations of the **Contractor** and/or its **Subcontractors** in the performance of this **Contract**.

7.6 The provisions of this Article shall not be deemed to create any new right of action in favor of third parties against the **Contractor** or the **City**.

### **CHAPTER III TIME PROVISIONS**

#### **ARTICLE 8. COMMENCEMENT AND PROSECUTION OF THE WORK**

8.1 The **Contractor** shall commence **Work** on the date specified in a written notice signed by the **Commissioner**. The time for performance of the **Work** under the **Contract** shall be computed from the date specified in such written notice. **TIME BEING OF THE ESSENCE** to the **City**, the **Contractor** shall thereafter prosecute the **Work** diligently, using such **Means and Methods of Construction** as are in accord with Article 4 herein and as will assure its completion not later than the date specified herein, or on the date to which the time for completion may be extended.

#### **ARTICLE 9. PROGRESS SCHEDULES**

9.1 To enable the **Work** to be performed in an orderly and expeditious manner, the **Contractor**, within fifteen (15) **Days** after the Notice to Proceed with this **Contract**, unless otherwise directed by the **Engineer**, shall submit to the **Engineer** a proposed progress schedule in the form of a bar graph or in such other form as specified by the **Engineer**, and monthly cash flow requirements, showing:

9.1.1 The anticipated time of commencement and completion of each of the various operations to be performed under this **Contract**; and

9.1.2 The sequence and interrelation of each of these operations with the others and with those of other related **Contracts**; and

9.1.3 The estimated time required for fabrication or delivery, or both, of all materials and equipment required for the **Work**; and

9.1.4 The estimated amount in dollars the **Contractor** will claim on a monthly basis.

9.2 The proposed schedule shall be revised as directed by the **Engineer**, until finally approved by the **Engineer**, and after such approval, subject to the provisions of Article 11, shall be strictly adhered to by the **Contractor**.

9.3 If the **Contractor** shall fail to adhere to the approved progress schedule, or to the schedule as revised pursuant to Article 11, it shall promptly adopt such other or additional **Means and Methods of Construction** as will make up for the time lost and will assure completion in accordance with the approved progress schedule. The approval by the City of a progress schedule which is shorter than the time allotted under the **Contract** shall not create any liability for the City if the approved progress schedule is not met.

9.4 The **Contractor** will not receive any payments until the proposed progress schedule is submitted.

#### **ARTICLE 10. REQUESTS FOR INFORMATION OR APPROVAL**

10.1 From time to time as the **Work** progresses and in the sequence indicated by the approved progress schedule, the **Contractor** shall submit to the **Engineer** a specific request in writing for each item of information or approval required by the **Contractor**. These requests shall state the latest date upon which the information or approval is actually required by the **Contractor**, and shall be submitted in a reasonable time in advance thereof to enable the **Engineer** a sufficient time to act upon such submissions, or any necessary re-submissions thereof.

10.2 The **Contractor** shall not have any right to an extension of time on account of delays due to the **Contractor's** failure to submit requests for the required information or the required approval in accordance with the above requirements.

#### **ARTICLE 11. NOTICE OF CONDITIONS CAUSING DELAY AND DOCUMENTATION OF DAMAGES CAUSED BY DELAY**

11.1 After the commencement of any condition which is causing or may cause a delay in completion of the **Work**, including conditions for which the **Contractor** may be entitled to an extension of time, the following notifications and submittals are required:

11.1.1 Within seven (7) **Days** after the commencement of such condition, the **Contractor** must notify the **Engineer** in writing of the existence, nature and effect of such condition upon the approved progress schedule and the **Work**, and must state why and in what respects, if any, the condition is causing or may cause a delay.

11.1.2 If the **Contractor** shall claim to be sustaining damages for delay as provided for in this Article, within forty-five (45) **Days** from the time such damages are first incurred, and every thirty (30) **Days** thereafter for as long as such damages are being incurred, the **Contractor** shall submit to the **Commissioner** verified written statements of the details and the amounts of such damages, together with documentary evidence of such damages, ("statement of delay damages") as further detailed in Section 11.6. The **Contractor** may submit any of the above statements within such additional time as may be granted by the **Commissioner** in writing upon written request therefor. On failure of the **Contractor** to fully comply with all of the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the **Contractor** may claim in any action arising under or by reason of this **Contract** shall not be different from or in excess of the statements made and documentation provided pursuant to this article.

11.1.3 Within 60 days of submission of the final verified statement of claims pursuant to Article 44, the **Commissioner** shall make a determination as to whether a compensable

delay has occurred and, if so, the amount of compensation due the **Contractor**. Notwithstanding the above, the **Commissioner** may make a determination as to whether a compensable delay has occurred at any time after the **Contractor's** first submission of a statement of delay damages.

11.2 Failure of the **Contractor** to strictly comply with the requirements of Article 11.1.1 may, in the discretion of the **Commissioner**, be deemed sufficient cause to deny any extension of time on account of delay arising out of such condition. Failure of the **Contractor** to strictly comply with the requirements of Articles 11.1.1 and 11.1.2 shall be deemed a conclusive waiver by the **Contractor** of any and all claims for damages for delay arising from such condition and no right to recover on such claims shall exist.

11.3 When appropriate and directed by the **Engineer**, the progress schedule shall be revised by the **Contractor** until finally approved by the **Engineer**. The revised progress schedule must be strictly adhered to by the **Contractor**.

#### 11.4 Compensable Delays

11.4.1 The **Contractor** agrees to make claim only for additional costs attributable to delay in the performance of this **Contract** necessarily extending the time for completion of the **Work** or resulting from acceleration directed by the City and required to maintain the project schedule, occasioned solely by any act or omission to act of the **City** listed below. The **Contractor** also agrees that delay from any other cause shall be compensated, if at all, solely by an extension of time to complete the performance of the **Work**.

11.4.1.1 The failure of the **City** to take reasonable measures to coordinate and progress the **Work**, except that the **City** shall not be responsible for the **Contractor's** obligation to coordinate and progress the **Work** of its subcontractors.

11.4.1.2 Extended delays attributable to the **City** in the review or issuance of change orders, in shop drawing reviews and approvals or as a result of the cumulative impact of multiple change orders, which have a verifiable impact on project costs.

11.4.1.3 The unavailability of the site for an extended period of time that significantly affects the scheduled completion of the **contract**.

11.4.1.4 The issuance by the **Engineer** of a stop work order relative to a substantial portion of work for a period exceeding thirty days, that was not brought about through any action or omission of the **Contractor**.

11.4.1.5 Differing site conditions that were not known or reasonably ascertainable on a pre-bid inspection of the site or review of the bid documents or other publicly available sources and that are not ordinarily encountered in the **Project's** geographical area or neighborhood or in the type of work to be performed.

11.4.1.6 Delays caused by the **City's** bad faith or its willful, malicious, or grossly negligent conduct;

11.4.1.7 Delays not contemplated by the parties;

11.4.1.8 Delays so unreasonable that they constitute an intentional abandonment of the **Contract** by the **City**; and

11.4.1.9 Delays resulting from the **City's** breach of a fundamental obligation of the **Contract**.

11.4.2 The provisions of this Article apply only to claims for additional costs attributable to delay and do not preclude determinations by the **Commissioner** allowing reimbursements for additional costs for **Extra Work** pursuant to Articles 25 and 26 of this **Contract**. To the extent that any cost attributable to delay is reimbursed as part of a change order, no additional claim for compensation under this section shall be allowed.

11.5 Non-Compensable Delays. The **Contractor** agrees to make no monetary request for, and has included in its bid prices for the various items of the **Contract**, the extra/additional costs attributable to any delays

caused by or attributable to the items set forth below. For such items, the **Contractor** shall be compensated, if at all, solely by an extension of time to complete the performance of the **Work**, in accordance with the provisions of Article 13. Such extensions of time will be granted, if at all, pursuant to the grounds set forth in Article 13.3.

11.5.1 The acts or omissions of any third parties, including but not limited to other contractors, public/ governmental bodies (other than **City** agencies), utilities or private enterprises, who are disclosed in the contract documents or are ordinarily encountered or generally recognized as related to the **Work**;

11.5.2 Any situation which was within the contemplation of the parties at the time of entering into the **Contract**, including any delay indicated or disclosed in the contract documents or generally recognized as related to the nature of the **Work**, and/or the existence of any facility or appurtenance owned, operated or maintained by any third party, as indicated or disclosed in the contract documents or ordinarily encountered or generally recognized as related to the nature of the **Work**;

11.5.3 Restraining orders, injunctions or judgments issued by a court which were caused by a Contractor's submission, action or inaction or by a Contractor's means and methods of construction, or by third-parties, unless such order, injunction or judgment was the result of an action or omission by the **City**;

11.5.4 Any labor boycott, strike, picketing or similar situation;

11.5.5 Any shortages of supplies of materials required by the contract work;

11.5.6 Climatic conditions, storms, floods, droughts, tidal waves, fires, hurricanes, earthquakes, landslides or other catastrophes, or acts of war or of the public enemy or terrorist acts;

11.5.7 Extra work which does not significantly affect the overall completion of the contract, reasonable delays in the review or issuance of change orders or field orders and/or in shop drawing reviews or approvals.

#### 11.6 Required Content of Submission of Statement of Delay Damages

11.6.1 In the verified written statement of delay damages required by Article 11.1.2, the following information shall be provided by the **Contractor**:

11.6.1.1 For each delay, the dates of the claimed periods of delay and, in addition, a description of the operations that were delayed, the reasons for the delay and an explanation of how they were delayed.

11.6.1.2 A detailed factual statement of the claim providing all necessary dates, locations and items of work affected by the claim.

11.6.1.3 The amount of additional compensation sought and a breakdown of that amount into categories as described in Article 26.2, subject to the limitations set forth in section 11.7.

11.6.1.4 Any additional information requested by the **Commissioner**.

#### 11.7 Recoverable Costs

11.7.1 Delay damages may be recoverable for the following costs actually and necessarily incurred in the performance of the **Work**:

11.7.1.1 Labor;

11.7.1.2 Materials;

11.7.1.3 Equipment;

- 11.7.1.4 Extended Field Office Costs;
- 11.7.1.5 Extended Contract Site Overhead;
- 11.7.1.6 Extended Home office overhead; and
- 11.7.1.7 Insurance and Bond Costs.

11.7.2 Recoverable Subcontractor Costs. When the work is performed by a **Subcontractor**, the **Contractor** may be paid the actual and necessary costs of such subcontracted work as outlined above in 11.7.1.1 through 11.7.1.6, and an additional overhead of 5% of the costs outlined in 11.7.1.1 through 11.7.1.3.

11.7.3 Non-Recoverable Costs. The parties agree that the **City** will have no liability for the following items and the **Contractor** agrees it shall make no claim for the following items:

- 11.7.3.1 Profit, or loss of anticipated or unanticipated profit;
- 11.7.3.2 Consequential damages, including but not limited to interest on monies in dispute, including interest which is paid on such monies, loss of bonding capacity, bidding opportunities, or interest in investment, or any resulting insolvency;
- 11.7.3.3 Indirect costs or expenses of any nature;
- 11.7.3.4 Direct or indirect costs attributable to performance of work where the **Contractor**, because of situations or conditions within its control, has not progressed the work in a satisfactory manner; and
- 11.7.3.5 Attorneys' fees and dispute and claims preparation expenses.

11.8 Determinations under this Article 11 are not subject to the jurisdiction of the Contract Dispute Resolution Board pursuant to the dispute resolution process set forth in Article 27.

11.9 If the parties agree that a compensable delay has occurred and agree on the amount of compensation, payment may be made pursuant to a written change order, subject to pre-audit by the **Engineering Audit Officer**, and may be post-audited by the **Comptroller** and/or the **Department**.

## **ARTICLE 12. COORDINATION WITH OTHER CONTRACTORS**

12.1 During the progress of the **Work**, **Other Contractors** may be engaged in performing other work or may be awarded other contracts for additional work on this **Project**. In that event, the **Contractor** shall coordinate the **Work** to be done hereunder with the work of such **Other Contractors** and the **Contractor** shall fully cooperate with such **Other Contractors** and carefully fit its own **Work** to that provided under other contracts as may be directed by the **Engineer**. The **Contractor** shall not commit or permit any act which will interfere with the performance of work by any **Other Contractors**.

12.2 If the **Engineer** shall determine that the **Contractor** is failing to coordinate its **Work** with the work of **Other Contractors** as the **Engineer** has directed, then the **Commissioner** shall have the right to withhold any payments otherwise due hereunder until the **Contractor** completely complies with the **Engineer's** directions.

12.3 The **Contractor** shall notify the **Engineer** in writing if any **Other Contractor** on this **Project** is failing to coordinate its work with the **Work** of this **Contract**. If the **Engineer** finds such charges to be true, the **Engineer** shall promptly issue such directions to the **Other Contractor** with respect thereto as the situation may require. The **City** shall not, however, be liable for any damages suffered by any **Other Contractor's** failure to coordinate its work with the **Work** of this **Contract** or by reason of the **Other Contractor's** failure to promptly comply with the directions so issued by the **Engineer**, or by reason of any **Other Contractor's** default in performance, it being understood that the **City** does not guarantee the responsibility or continued efficiency of any contractor. Except as provided for in Article 11.4.1.1, the **Contractor** agrees to make no claim against the **City** for

any damages relating to or arising out of any timely directions issued by the **Engineer** pursuant to this article (including but not limited to the failure of any **Other Contractor** to comply or promptly comply with such directions), or the failure of any **Other Contractor** to coordinate its work, or the default in performance of any **Other Contractor**.

12.4 The **Contractor** shall indemnify and hold the **City** harmless from any and all claims or judgments for damages and from costs and expenses to which the **City** may be subjected or which it may suffer or incur by reason of the **Contractor's** failure to comply with the **Engineer's** directions promptly; and the **Comptroller** shall have the right to exercise the powers reserved in Article 23 with respect to any claims which may be made for damages due to this **Contractor's** failure to comply with the **Engineer's** direction promptly. Insofar as the facts and Law relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by Law.

12.5 Should the **Contractor** sustain any damage through any act or omission of any **Other Contractor** having a contract with the **City** for the performance of work upon the **Site** or of work which may be necessary to be performed for the proper prosecution of the **Work** to be performed hereunder, or through any act or omission of a **Subcontractor** of such **Contractor**, the **Contractor** shall have no claim against the **City** for such damage, but shall have a right to recover such damage from the **Other Contractor** under the provision similar to the following provisions which apply to this **Contract** and have been or will be inserted in the contracts with such **Other Contractors**:

12.5.1 Should any **Other Contractor** having or who shall hereafter have a contract with the **City** for the performance of work upon the **Site** sustain any damage through any act or omission of the **Contractor** hereunder or through any act or omission of any **Subcontractor** of the **Contractor**, the **Contractor** agrees to reimburse such **Other Contractor** for all such damages and to defend at its own expense any suit based upon such claim and if any judgment or claims (even if the allegations of the suit are without merit) against the **City** shall be allowed the **Contractor** shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and agrees to indemnify and hold the **City** harmless from all such claims. Insofar as the facts and Law relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by Law.

12.6 The **City's** right to indemnification hereunder shall in no way be diminished, waived or discharged, by its recourse to assessment of liquidated damages as provided in Article 15, or by the exercise of any other remedy provided for by **Contract** or by Law.

### **ARTICLE 13. EXTENSION OF TIME FOR PERFORMANCE**

13.1 If performance by the **Contractor** is delayed for a reason set forth in Article 13.3, the **Contractor** may be allowed a reasonable extension of time in conformance with this article and the **PPB Rules**.

13.2 Any extension of time may be granted only by the **Commissioner** or by the Board for the Extension of Time (hereafter "**Board**") (as set forth below) upon written application by the **Contractor**.

13.3 Grounds for Extension: If such application is made, the **Contractor** shall be entitled to an extension of time for delay in completion of the **Work** caused solely:

13.3.1 By the acts or omissions of the **City**, its officers, agents or employees; or

13.3.2 By the act or omissions of **Other Contractors** on this **Project**; or

13.3.3 By supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, excessive inclement weather, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes not brought about by any act or omission of the **Contractor**).

13.3.4 The **Contractor** shall, however, be entitled to an extension of time for such causes only for the number of **Days** of delay which the **Commissioner** or the Board may determine to be due solely to such causes, and then only if the **Contractor** shall have strictly complied with all of the requirements of Articles 9 and 10.

13.4 The **Contractor** shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the **Work** as determined by the **Commissioner** or the Board, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the **Contractor** or of its **Subcontractors** or **Materialmen**, and would of itself (irrespective of the concurrent causes) have delayed the **Work**, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.

13.5 The determination made by the **Commissioner** or the Board on an application for an extension of time shall be binding and conclusive on the **Contractor**.

13.6 The granting of an application for an extension of time for causes of delay other than those herein referred to shall be entirely within the discretion of the **Commissioner** or the Board.

13.7 Permitting the **Contractor** to continue with the **Work** after the time fixed for its completion has expired, or after the time to which such completion may have been extended has expired, or the making of any payment to the **Contractor** after such time, shall in no way operate as a waiver on the part of the City of any of its rights under this **Contract**.

#### 13.8 Application for Extension of Time:

13.8.1 Before the **Contractor's** time extension request will be considered, the **Contractor** shall notify the **Commissioner** of the condition which allegedly has caused or is causing the delay, and shall submit a written application to the **Commissioner** identifying:

13.8.1(a) The **Contractor**; the registration number; and **Project** description;

13.8.1(b) Liquidated damage assessment rate, as specified in the **Contract**;

13.8.1(c) Original bid amount;

13.8.1(d) The original **Contract** start date and completion date;

13.8.1(e) Any previous time extensions granted (number and duration); and

13.8.1(f) The extension of time requested.

13.8.2 In addition, the application for extension of time shall set forth in detail:

13.8.2(a) The nature of each alleged cause of delay in completing the **Work**;

13.8.2(b) The date upon which each such cause of delay began and ended and the number of **Days** attributable to each such cause;

13.8.2(c) A statement that the **Contractor** waives all claims except for those delineated in the application, and the particulars of any claims which the **Contractor** does not agree to waive. For time extensions for **Substantial Completion** and final completion payments, the application shall include a detailed statement of the dollar amounts of each element of claim item reserved; and

13.8.2(d) A statement indicating the **Contractor's** understanding that the time extension is granted only for purposes of permitting continuation of **Contract** performance and payment for **Work** performed and that the **City** retains its right to conduct an investigation and assess liquidated damages as appropriate in the future.

### 13.9 Analysis and Approval of Time Extensions:

13.9.1 For time extensions for partial payments, a written determination shall be made by the **Commissioner** who may, for good and sufficient cause, extend the time for the performance of the **Contract** as follows:

13.9.1(a) If the **Work** is to be completed within six (6) months, the time for performance may be extended for sixty (60) **Days**;

13.9.1(b) If the **Work** is to be completed within less than one (1) year but more than six (6) months, an extension of ninety (90) **Days** may be granted;

13.9.1(c) If the **Contract** period exceeds one (1) year, besides the extension granted in Article 13.9.1(b), an additional thirty (30) **Days** may be granted for each multiple of six (6) months involved beyond the one (1) year period; or

13.9.1(d) If exceptional circumstances exist, the **Commissioner** may extend the time for performance beyond the extensions in Articles 13.9.1(a), 13.9.1(b), and 13.9.1(c). In that event, the **Commissioner** shall file with the Mayor's Office of Contract Services a written explanation of the exceptional circumstances.

13.9.2 For extensions of time for **Substantial Completion** and final completion payments, the **Engineer**, in consultation with the **Commissioner**, shall prepare a written analysis of the delay (including a preliminary determination of the causes of delay, the beginning and end dates for each such cause of delay, and whether the delays are excusable under the terms of this **Contract**). The report shall be subject to review by and approval of the Board, which shall have authority to question its analysis and determinations and request additional facts or documentation. The report as reviewed and made final by the Board shall be made a part of the **Agency Contract** file. Neither the report itself nor anything contained therein shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

13.9.3 Approval Mechanism for Time Extensions for **Substantial Completion** or Final Completion Payments: An extension shall be granted only with the approval of the Board which is comprised of the **ACCO** of the **Agency**, the Corporation Counsel and the **Comptroller**, or their authorized representatives.

13.9.4 Neither the granting of any application for an extension of time to the **Contractor** or any other **Contractor** on this **Project** nor the papers, records or reports related to any application for or grant of an extension of time or determination related thereto shall be



referred to or offered in evidence by the **Contractor** or its attorneys in any action or proceeding.

13.10 **No Damage for Delay:** The **Contractor** agrees to make no claim for damages for delay in the performance of this **Contract** except as set forth in Article 11, and agrees that all it may be entitled to on account of any such delay for which compensation is not specifically provided for in Article 11 is an extension of time to complete performance of the **Work** as provided herein.

#### **ARTICLE 14. COMPLETION AND FINAL ACCEPTANCE OF THE WORK**

14.1 **Date for Substantial Completion:** The **Contractor** shall substantially complete the **Work** within the time fixed in Schedule A of the General Conditions, or within the time to which such **Substantial Completion** may be extended.

14.2 **Determining the Date of Substantial Completion:** The **Work** will be deemed to be substantially complete when the two conditions set forth in Articles 14.2.1 and 14.2.2 have been met. The **Commissioner** will then issue a **Certificate of Substantial Completion**.

14.2.1 **Inspection:** The **Engineer** has inspected the **Work** and has made a written determination that it is substantially complete.

14.2.2 **Approval of Final Punch List and Date for Final Acceptance:** Following inspection of the **Work**, the **Engineer** shall furnish the **Contractor** a final punch list, specifying all items of **Work** to be completed. The **Contractor** shall then submit to the **Engineer** dates for the completion of each specified item of **Work**. Within a reasonable time after receipt, the **Engineer**, in a written notification to the **Contractor**, shall approve the **Contractor's** completion dates or, if they are unable to agree, shall establish dates for the completion of each item of **Work**. The latest completion date specified shall be the date for **Final Acceptance** of the **Work**.

14.3 **Determining the Date of Final Acceptance:** The **Work** will be accepted as final and complete as of the date of the **Engineer's** inspection if, upon such inspection, the **Engineer** finds that all items on the **Final Approved Punch List** are complete and no further **Work** remains to be done. The **Commissioner** will then issue a written determination of **Final Acceptance**.

14.4 **Request for Inspection:** Inspection of the **Work** by the **Engineer** for the purpose of **Substantial Completion** or **Final Acceptance** shall be made within ten (10) **Days** after receipt of the **Contractor's** written request therefor.

14.5 **Request for Re-inspection:** If upon inspection for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer** determines that there are items of **Work** still to be performed, the **Contractor** shall promptly perform them and then request a re-inspection. If upon re-inspection, the **Engineer** determines that the **Work** is substantially complete or finally accepted, the date of such re-inspection shall be the date of **Substantial Completion** or **Final Acceptance**. Re-inspection by the **Engineer** shall be made within ten (10) **Days** after receipt of the **Contractor's** written request therefor.

14.6 **Initiation of Inspection by the Engineer:** If the **Contractor** does not request inspection or re-inspection of the **Work** for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer** may initiate such inspection or re-inspection.

## **ARTICLE 15. LIQUIDATED DAMAGES**

15.1 In the event the **Contractor** fails to complete the **Work** within the time fixed for such completion in Schedule A of the General Conditions, plus authorized time extensions, or if the **Contractor**, in the sole determination of the **Commissioner**, has abandoned the **Work**, the **Contractor** shall pay to the **City** the sum fixed in Schedule A of the General Conditions, for each and every **Day** that the time consumed in completing the **Work** exceeds the time allowed therefor; which said sum, in view of the difficulty of accurately ascertaining the loss which the **City** will suffer by reason of delay in the completion of the **Work** hereunder, is hereby fixed and agreed as the liquidated damages that the **City** will suffer by reason of such delay, and not as a penalty. This article shall apply to the **Contractor** if it is defaulted pursuant to Chapter X of this **Contract**. Neither the failure to assess liquidated damages nor the granting of any time extension shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

15.2 Liquidated damages received hereunder are not intended to be nor shall they be treated as either a partial or full waiver or discharge of the **City's** right to indemnification, or the **Contractor's** obligation to indemnify the **City**, or to any other remedy provided for in this **Contract** or by **Law**.

15.3 The **Commissioner** may deduct and retain out of the monies which may become due hereunder, the amount of any such liquidated damages; and in case the amount which may become due hereunder shall be less than the amount of liquidated damages suffered by the **City**, the **Contractor** shall be liable to pay the difference.

## **ARTICLE 16. OCCUPATION OR USE PRIOR TO COMPLETION**

16.1 Unless otherwise provided for in the specifications, the **Commissioner** may take over, use, occupy or operate any part of the **Work** at any time prior to **Final Acceptance**, upon written notification to the **Contractor**. The **Engineer** shall inspect the part of the **Work** to be taken over, used, occupied, or operated, and will furnish the **Contractor** with a written statement of the **Work**, if any, which remains to be performed on such part. The **Contractor** shall not object to, nor interfere with, the **Commissioner's** decision to exercise the rights granted by this article. In the event the **Commissioner** takes over, uses, occupies, or operates any part of the **Work**:

16.1.1 the **Commissioner** shall issue a written determination of **Substantial Completion** with respect to such part of the **Work**;

16.1.2 the **Contractor** shall be relieved of its absolute obligation to protect such part of the unfinished **Work** in accordance with Article 7;

16.1.3 the **Contractor's** guarantee on such part of the **Work** shall begin on the date of such use by the **City**; and;

16.1.4 the **Contractor** shall be entitled to a return of so much of the amount retained in accordance with Article 21 as it relates to such part of the **Work**, except so much thereof as may be retained under Articles 24 and 44.

## **CHAPTER IV SUBCONTRACTS AND ASSIGNMENTS**

### **ARTICLE 17. SUBCONTRACTS**

17.1 The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price fixed in Schedule A of the General Conditions, without prior written permission from the **Commissioner**. All subcontracts made by the **Contractor** shall be in writing. No work may be performed by a

**Subcontractor** prior to the **Contractor** entering into a written subcontract with the **Subcontractor** and complying with the provisions of this Article 17.

17.2 Before making any subcontracts, the **Contractor** shall submit a written statement to the **Commissioner** giving the name and address of the proposed **Subcontractor**, the portion of the **Work** and materials which it is to perform and furnish, the cost of the subcontract, the VENDEX questionnaire if required, and any other information tending to prove that the proposed **Subcontractor** has the necessary facilities, skill, integrity, past experience and financial resources to perform the **Work** in accordance with the terms and conditions of this **Contract**.

17.3 If an approved **Subcontractor** elects to subcontract any portion of its subcontract, the proposed subcontract shall be submitted in the same manner as directed above.

17.4 The **Commissioner** will notify the **Contractor** in writing whether the proposed **Subcontractor** is qualified or not qualified. If the proposed **Subcontractor** is not qualified, the **Contractor** may submit another proposed **Subcontractor** unless the **Contractor** decides to do the **Work**. No **Subcontractor** shall be permitted on the **Site** unless approved.

17.5 Before entering into any subcontract hereunder, the **Contractor** shall inform the **Subcontractor** fully and completely of all provisions and requirements of this **Contract** relating either directly or indirectly to the **Work** to be performed and the materials to be furnished under such subcontract, and every such **Subcontractor** shall expressly stipulate that all labor performed and materials furnished by the **Subcontractor** shall strictly comply with the requirements of this **Contract**.

17.6 Documents given to a **Subcontractor** for the purpose of soliciting the **Subcontractor's** bid shall include either a copy of the bid cover or a separate information sheet setting forth the **Project** name, the **Contract** number (if available), the **Agency** (as noted in Article 2.1.6), and the **Project's** location.

17.7 The **Commissioner's** approval of a **Subcontractor** shall not relieve the **Contractor** of any of its responsibilities, duties and liabilities hereunder. The **Contractor** shall be solely responsible to the **City** for the acts or defaults of its **Subcontractor** and of such **Subcontractor's** officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the **Contractor** to the extent of its subcontract.

17.8 The **Contractor** shall be responsible for ensuring that all **Subcontractors** performing **Work** at the **Site** have either their own insurance coverage or are covered by the **Contractor's** insurance as required by Article 22.

17.9 The **Contractor** shall promptly, upon request, file with the **Engineer** a conformed copy of the subcontract and its cost. The subcontract shall provide the following:

17.9.1 **Payment to Subcontractors:** The agreement between the **Contractor** and its **Subcontractors** shall contain the same terms and conditions as to method of payment for **Work**, labor and materials, and as to retained percentages, as are contained in this **Contract**.

17.9.2 **Prevailing Rate of Wages:** The agreement between the **Contractor** and its **Subcontractors** shall include the prevailing wage rates and supplemental benefits to be paid in accordance with Labor Law Section 220.

17.9.3 **Section 6-123 of the Administrative Code:** Pursuant to the requirements of Section 6-123 of the Administrative Code, every agreement between the **Contractor** and its **Subcontractors** in excess of \$50,000 shall include a provision that the **Subcontractor** shall not engage in any unlawful discriminatory practice as defined in Title VIII of the Administrative Code (Section 8-101 et. seq.).

17.10 The **Commissioner** may deduct from the amounts certified under this **Contract** to be due to the **Contractor**, the sum or sums due and owing from the **Contractor** to the **Subcontractors** according to the terms of the said subcontracts, and in case of dispute between the **Contractor** and its **Subcontractor**, or **Subcontractors**, as to the amount due and owing, the **Commissioner** may deduct and withhold from the amounts certified under this **Contract** to be due to the **Contractor** such sum or sums as may be claimed by such **Subcontractor**, or **Subcontractors**, in a sworn affidavit, to be due and owing until such time as such claim or claims shall have been finally adjusted.

17.11 On **Contracts** where 100% performance bonds and payment bonds are executed, the **Contractor** shall include on each requisition for payment the following data: **Subcontractor's** name, value of the subcontract, total amount previously paid to **Subcontractor** for **Work** previously requisitioned, and the amount, including retainage, to be paid to the **Subcontractor** for **Work** included in the requisition.

17.12 On **Contracts** where performance bonds and payment bonds are not executed, the **Contractor** shall include with each requisition for payment submitted hereunder, a signed statement from each and every **Subcontractor** and/or **Materialman** for whom payment is requested in such requisition. Such signed statement shall be on the letterhead of the **Subcontractor** and/or **Materialman** for whom payment is requested and shall (i) verify that such **Subcontractor** and/or **Materialman** has been paid in full for all work performed and/or material supplied to date, exclusive of any amount retained and any amount included on the current requisition, and (ii) state the total amount of retainage to date, exclusive of any amount retained on the current requisition.

#### **ARTICLE 18. ASSIGNMENTS**

18.1 The **Contractor** shall not assign, transfer, convey or otherwise dispose of this **Contract**, or the right to execute it, or the right, title or interest in or to it or any part thereof, or assign, by power of attorney or otherwise any of the monies due or to become due under this **Contract**, unless the previous written consent of the **Commissioner** shall first be obtained thereto, and the giving of any such consent to a particular assignment shall not dispense with the necessity of such consent to any further or other assignments.

18.2 Such assignment, transfer, or conveyance shall not be valid until filed in the office of the **Commissioner** and the **Treasurer**, with the written consent of the **Commissioner** endorsed thereon or attached thereto.

18.3 Failure to obtain the previous written consent of the **Commissioner** to such an assignment, transfer or conveyance, may result in the revocation and annulment of this **Contract**. The **City** shall thereupon be relieved and discharged from any further liability to the **Contractor**, its assignees, transferees or sublessees, who shall forfeit and lose all monies therefor earned under the **Contract**, except so much as may be required to pay the **Contractor's** employees.

18.4 The provisions of this clause shall not hinder, prevent, or affect an assignment by the **Contractor** for the benefit of its creditors made pursuant to the **Laws** of the State of New York.

18.5 This **Contract** may be assigned by the **City** to any corporation, agency or instrumentality having authority to accept such assignment.

**CHAPTER V**  
**CONTRACTOR'S SECURITY AND GUARANTY**

**ARTICLE 19. SECURITY DEPOSIT**

19.1 The bid deposit, if required, shall be retained by the **Comptroller** as security for the **Contractor's** faithful performance of the **Contract** and will be returned to the **Contractor** only after the sum retained under Article 21 equals the amount of the bid deposit, subject to the other provisions of this **Contract**. If performance and payment bonds are required, any bid security posted shall be returned within a reasonable time after posting of such bonds and execution of this **Contract** by the **City**. When no partial payments are provided, the bid deposit will be released when final payment is certified to the **Comptroller** for payment.

19.2 If the **Contractor** is declared in default under Article 48 prior to the return of the deposit, or if any claim is made such as referred to in Article 23, the amount of such deposit, or so much thereof as the **Comptroller** may deem necessary, may be retained and then applied by the **Comptroller**:

19.2.1 To compensate the **City** for any expense, loss or damage suffered or incurred by reason of or resulting from such default, including the cost of re-letting and liquidated damages; or

19.2.2 To indemnify the **City** against any and all claims.

**ARTICLE 20. PAYMENT GUARANTEE**

20.1 On **Contracts** where 100% performance bonds and payment bonds are executed, this article does not apply.

20.2 In the event the terms of this **Contract** do not require the **Contractor** to provide a payment bond, the **City** shall, in accordance with the terms of this article, guarantee payment of all lawful demands for:

20.2.1 Wages and compensation for labor performed and/or services rendered; and

20.2.2 Materials, equipment, and supplies provided, whether incorporated into the **Work** or not, when demands have been filed with the **City** as provided hereinafter by any person, firm, or corporation which furnished labor, material, equipment, supplies, or any combination thereof, in connection with the **Work** performed hereunder (hereinafter referred to as the "beneficiary") at the direction of the **City** or the **Contractor**.

20.3 The provisions of Article 20.2 are subject to the following limitations and conditions:

20.3.1 The guarantee is made for the benefit of all beneficiaries as defined in Article 20.2 provided that those beneficiaries strictly adhere to the terms and conditions of this Article 20.3.

20.3.2 Nothing in this article shall prevent a beneficiary providing labor, services or material for the **Work** from suing the **Contractor** for any amounts due and owing the beneficiary by the **Contractor**.

20.3.3 All demands made against the **City** pursuant to this article shall be made within four (4) months from the date payment is due on the invoice or invoices submitted by the beneficiary to the **Contractor** for labor or **Work** done or for materials or supplies delivered, or, if the demand is for wages, four (4) months from the date the wages were due to be paid to the beneficiary.

20.3.4 All demands made against the City by such beneficiary shall be presented to the **Engineer** along with all written documentation concerning the demand which the **Engineer** deems appropriate or necessary, which may include, but shall not be limited to: the subcontract; any invoices presented to the **Contractor** for payment; the notarized statement of the beneficiary that the demand is due and payable, that a request for payment has been made of the **Contractor** and that the demand has not been paid by the **Contractor** within the time allowed for such payment by the subcontract; and copies of any correspondence between the beneficiary and the **Contractor** concerning such demand. The City shall notify the **Contractor** that a demand has been made. The **Contractor** shall inform the City of any defenses to the demand, and shall forward to the City any documents the City requests concerning the demand.

20.3.5 The City shall make payment only if, after considering all defenses presented by the **Contractor**, it determines that the payment is due and owing to the beneficiary making the demand.

20.3.6 The City will not initiate the payment process of this article or make payment on a demand where the beneficiary making the demand has filed a lien against the **Work** or otherwise sues the City prior to receiving a written notice from the City that it will not pay the demand.

20.3.7 No beneficiary shall be entitled to interest from the City, or to any other costs, including, but not limited to, attorney's fees.

20.4 Upon the receipt by the City of a demand pursuant to this article, the City may withhold from any payment otherwise due and owing to the **Contractor** under this **Contract** an amount sufficient to satisfy the demand.

20.4.1 In the event the City determines that the demand is valid, the City shall notify the **Contractor** of such determination and the amount thereof, and direct the **Contractor** to immediately pay such amount to the beneficiary. In the event the **Contractor**, within seven (7) days of receipt of such notification from the City, fails to pay the beneficiary, such failure shall constitute an automatic and irrevocable assignment of payment by the **Contractor** to the beneficiary for the amount of the demand determined by the City to be valid. The **Contractor**, without further notification or other process, hereby gives its unconditional consent to such assignment of payment to the beneficiary and authorizes the City, on its behalf, to take all necessary actions to implement such assignment of payment, including without limitation the execution of any instrument or documentation necessary to effectuate such assignment.

In the event that the amount otherwise due and owing to the **Contractor** by the City is insufficient to satisfy such demand, the City may, at its option, require payment from the **Contractor** of an amount sufficient to cover such demand and exercise any other right to require or recover payment which the City may have under **Law** or **Contract**.

20.4.2 In the event the City determines that the demand is invalid, any amount withheld pending the City's review of such demand shall be paid to the **Contractor**; provided, however, no lien has been filed. In the event a lien has been filed, the terms and conditions set forth in Article 23 shall apply.

20.5 The provisions of this article shall not prevent the City and the **Contractor** from resolving disputes in accordance with the PPB Rules, where applicable.

20.6 In the event the City determines that the beneficiary is entitled to payment pursuant to this article, such determination and any defenses and counterclaims raised by the **Contractor** shall be taken into account in evaluating the **Contractor's** performance.

20.7 Nothing in this article shall relieve the **Contractor** of the obligation to pay the claims of all persons with valid and lawful claims against the **Contractor** relating to the **Work**.

20.8 The **Contractor** shall not require any performance, payment or other bonds of any **Subcontractor** if this **Contract** does not require such bonds of the **Contractor**.

20.9 The payment guarantee made pursuant to this article shall be construed in a manner consistent with Section 137 of the State Finance Law and shall afford to persons furnishing labor or materials to the **Contractor** or his **Subcontractors** in the prosecution of the **Work** under this **Contract** all of the rights and remedies afforded to such persons by such section, including but not limited to, the right to commence an action against the **City** on the payment guarantee provided by this article within the one year limitations period set forth in Section 137(4)(b).

## **ARTICLE 21. RETAINED PERCENTAGE**

21.1 If this **Contract** requires 100% performance and payment security, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.2 If this **Contract** does not require 100% performance and payment security and if the price for which this **Contract** was awarded does not exceed \$500,000, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.3 If this **Contract** does not require 100% performance and payment security and if the price for which this **Contract** was awarded exceeds \$500,000, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, up to ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher. The percentage to be retained is set forth in Schedule A of the General Conditions.

## **ARTICLE 22. INSURANCE**

22.1 Types of Insurance: From the date the **Contractor** is required to provide Proof of Insurance pursuant to Article 22.3.1 through the date of completion of all required **Work** (including punch list work as certified in writing by the **Resident Engineer**), the **Contractor** shall effect and maintain the following types of insurance if and as indicated in Schedule A of the General Conditions (with the minimum limits and special conditions specified in Schedule A). Such insurance shall be issued by companies that meet the standards of Article 22.2.1 and shall be primary (and non-contributing) to any insurance or self-insurance maintained by the **City**.

22.1.1 Commercial General Liability Insurance: The **Contractor** shall provide a Commercial General Liability Insurance policy covering the **Contractor** as Named Insured and the **City** as an Additional Insured. This policy shall protect the **City** and the **Contractor** from claims for property damage and/or bodily injury, including death, which may arise from any of the operations under this **Contract**. Coverage under this policy shall be at least as broad as that provided by ISO Form CG 0001 (10/01 ed.), must be "occurrence" based rather than "claims-made", and shall include, without limitation, the following types of coverage: Premises Operations, Products and Completed Operations, Contractual Liability (including the tort liability of another assumed in a contract), Broad Form Property Damage, Medical Payments, Independent Contractors, Personal Injury (Contractual Exclusion deleted), Explosion, Collapse and Underground Property, and Incidental Malpractice. If such insurance contains an aggregate limit, it shall apply separately to this Project.

22.1.1(a) Such Commercial General Liability Insurance shall name the City, together with its officials and employees, as an Additional Insured under this policy. Coverage for the City as Additional Insured shall specifically include the City's officials and employees, and shall be at least as broad as either Insurance Services Office ("ISO") Form CG 20 10 (07/04 ed.) or Form CG 20 33 (07/04 ed.) and shall provide completed operations coverage at least as broad as CG 20 37 (07/04 ed.).

22.1.1(b) If this Contract is equal to or greater than Ten Million Dollars (\$10,000,000.00), each Commercial General Liability Insurance policy provided shall contain each of the following endorsements:

22.1.1(b)(i) The Duties in the Event of Occurrence, Claim or Suit condition of the policy is amended per the following: If and insofar as knowledge of an "occurrence", "claim", or "suit" is relevant to the City of New York as Additional Insured under this policy, such knowledge by an agent, servant, official, or employee of the City of New York will not be considered knowledge on the part of the City of New York of the "occurrence", "claim", or "suit" unless the following position shall have received notice thereof from such agent, servant, official, or employee: Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department; and

22.1.1(b)(ii) Any notice, demand or other writing by or on behalf of the Named Insured to the Insurance Company shall also be deemed to be a notice, demand, or other writing on behalf of the City as Additional Insured. Any response by the Insurance Company to such notice, demand or other writing shall be addressed to Named Insured and to the City at the following addresses: Insurance Unit, NYC Comptroller's Office, 1 Centre Street - Room 1222, New York, N.Y. 10007; and Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, NY 10007.

22.1.2 Workers' Compensation Insurance and Disability Benefits Insurance: The Contractor shall provide, and ensure that each Subcontractor provides, Workers Compensation Insurance and Disability Benefits Insurance in accordance with the Laws of the State of New York on behalf of all employees providing services under this Contract (except for those qualifying for insurance pursuant to Article 22.1.4).

22.1.3 Employers' Liability Insurance: The Contractor shall provide, and ensure that each Subcontractor provides, Employers Liability Insurance affording compensation due to bodily injury by accident or disease sustained by any employee arising out of and in the course of his/her employment under this Contract (except for those qualifying for insurance pursuant to Article 22.1.4).

22.1.4 United States Longshoremen's and Harbor Workers Act and/or Jones Act Insurance: The Contractor shall provide, and ensure that each Subcontractor provides, insurance in accordance with the United States Longshoremen's and Harbor Workers Act and/or the Jones Act, on behalf of all qualifying employees providing services under this Contract.

22.1.5 Builders' Risk Insurance: The Contractor shall provide a Builders' Risk Insurance policy covering all risks in completed value form. Such policy shall cover the total value of the Work performed in accordance with Schedule A, as well as the value of any equipment, supplies and/or material for the Project that may be in storage (on or off the Site) or in transit. The policy shall cover the cost of removing debris, including demolition as may be legally necessary by the operation of any law, ordinance or regulation, and for loss or damage to any owned, borrowed, leased or rented capital equipment, tools, including tools of their agents and employees, staging towers and forms,



and property of the City held in their care, custody and/or control. Such policy shall name as insureds the City, the Contractor, and its Subcontractors. The Builders' Risk policy shall contain the following endorsements:

22.1.5(a) The City and the Contractor shall be named as loss payee for the Work in order of precedence, as their interest may appear; and

22.1.5(b) In the event the loss occurs at an occupied facility, the policy shall permit occupancy without the consent of the Insurance Company; and

22.1.5(c) In the event that the insurance policy has been issued by a mutual insurance company, the following language shall be included: "The City of New York is not liable for any premium or assessment under this policy of insurance. The First Named Insured is solely liable therefor."

22.1.6 Comprehensive Business Automobile Liability Insurance: The Contractor shall provide a Comprehensive Business Automobile Liability policy for liability arising out of any owned, non-owned, leased and hired vehicles to be used in connection with this Contract. Coverage should be at least as broad as ISO Form CA0001, ed. 10/01.

22.1.6(a) If autos are used for transporting hazardous materials, the Automobile Liability Insurance shall be endorsed to provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90.

22.1.7 Pollution/Environmental Liability Insurance: The Contractor shall provide Pollution/Environmental Liability Insurance covering bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured. Such insurance shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants (including asbestos), including any loss, cost or expense incurred as a result of any cleanup of pollutants (including asbestos) or in the investigation, settlement or defense of any claim, suit, or proceedings against the City arising from the operations under this Contract. Such insurance shall be in the Contractor's name and list the City as an Additional Insured. Coverage for the City as Additional Insured shall specifically include the City's officials and employees, and shall be at least as broad as provided to the Contractor for this Project.

22.1.7(a) If such coverage is written on a claims-made policy, such policy shall have a retroactive date on or before the effective date of this Contract, and continuous coverage shall be maintained, or an extended discovery period exercised, for a period of not less than three years from the time the Work under this Contract is completed.

22.1.8 Marine Insurance:

22.1.8(a) Marine Protection and Indemnity Insurance: The Contractor shall provide a Marine Protection and Indemnity policy with coverage at least as broad as policy form SP-23. The policy shall provide coverage for the Contractor and for the City (together with its officials and employees) as Additional Insured for bodily injury and property damage arising from marine operations under this Contract including injury or death of crew members (if not fully provided through other insurance), damage to piers, wharves and other fixed or movable structures and loss of or damage to any other vessel or craft, or to property on such other vessel or craft, not caused by collision.

22.1.8(b) Ship Repairers Legal Liability Insurance: The Contractor shall provide a Ship Repairers Legal Liability Insurance policy covering all repair operations under this Contract at

or in the vicinity of a designated approved port or yard under this **Contract**. The policy shall provide coverage from the point of acceptance of care custody and control of any **City** vessel. The policy shall provide Bailee Coverage for any **City** vessel in the **Contractor's** care, custody and control and coverage for damage to property of others caused by any **City** vessel in the **Contractor's** care custody and control.

22.1.8(c) Collision Liability/Towers Liability Insurance: The **Contractor** shall provide a Collision Liability/Towers Liability Insurance policy with coverage for the **Contractor** and for the **City** (together with its officials and employees) as Additional Insured at least as broad as the American Institute Tug Form (08/01/76) for all tugs used under this **Contract** and Collision Liability per American Institute Hull Clauses (6/2/77).

22.1.8(d) Marine Pollution Liability Insurance: The **Contractor** shall provide a Marine Pollution Liability Insurance policy covering itself as Named Insured and the **City** (together with its officials and employees) as Additional Insured for liability arising from the discharge or substantial threat of a discharge of oil, or from the release or threatened release of a hazardous substance including injury to, or economic losses resulting from, the destruction of or damage to real property, personal property or natural resources. Coverage under this policy shall be at least as broad as that provided by Water Quality Insurance Syndicate Form (09/98 ed.).

22.1.9 The **Contractor** shall provide such other types of insurance, at such minimum limits, as are specified in Schedule A of the General Conditions.

## 22.2 General Requirements for Insurance Policies:

22.2.1 All required insurance policies shall be maintained with companies that may lawfully issue the required policy and have an A.M. Best rating of at least A- VII or a Standard and Poor's rating of at least AA, unless prior written approval is obtained from the Mayor's Office of Operations.

22.2.2 The **Contractor** shall be solely responsible for the payment of all premiums for all required policies and all deductibles and self-insured retentions to which such policies are subject, whether or not the **City** is an insured under the policy.

22.2.3 In his/her sole discretion, the **Commissioner** may, subject to the approval of the **Comptroller** and the Corporation Counsel, accept Letters of Credit and/or custodial accounts in lieu of required insurance.

22.2.4 The **City's** limits of coverage for all types of insurance required pursuant to Schedule A of the General Conditions shall be the greater of (i) the minimum limits set forth in Schedule A or (ii) the limits provided to the **Contractor** as Named Insured under all primary, excess and umbrella policies of that type of coverage.

22.2.5 All required insurance policies, except for insurance required pursuant to Sections 22.1.2, 22.1.3, and 22.1.4, shall contain the following endorsement: "This policy may not be cancelled, terminated, modified or changed unless thirty (30) days prior written notice is sent by the Insurance Company to the Named Insured (or First Named Insured, as appropriate), the **Commissioner**, and to the **Comptroller**, attn: Office of Contract Administration, Municipal Building, Room 1005, New York, New York 10007."

## 22.3 Proof of Insurance:

22.3.1 Within ten (10) Days of award, the **Contractor** shall, for each policy required under this **Contract**, except for Workers Compensation Insurance and Disability Benefits Insurance and builders' risk insurance, file a Certificate of Insurance with the **Commissioner** pursuant to Article 22.6. For Workers' Compensation Insurance and Disability Benefits Insurance, the **Contractor** shall file proof of insurance in a form acceptable to the **Commissioner** within ten (10) Days of award. Accord forms are not acceptable proof of workers' compensation coverage. The **Contractor** must submit one of the following forms to the Department, or another form acceptable to the Department: C-105.2 -- Certificate of Workers' Compensation Insurance, or U-26.3 -- State Insurance Fund Certificate of Workers' Compensation Insurance. For builders' risk insurance, the **Contractor** shall file a Certificate of Insurance with the **Commissioner** at the direction of the **Commissioner** but in any event no later than ten (10) Days prior to commencement of the **Work**.

22.3.1(a) All Certificates of Insurance shall be in a form acceptable to the **City** and shall certify the issuance and effectiveness of the types of insurance specified in Schedule A, each with the specified minimum limits and evidence of the compliance with the Additional Insured or Named Insured provisions of Articles 22.1.1(a), 22.1.5, 22.1.7, and 22.1.8, as applicable. All Certificate(s) of Insurance shall be accompanied by either a duly executed "Certification by Broker" in the form contained in Part II of Schedule A or completed copies of all policies referenced in the Certificate of Insurance. In the absence of completed policies, binders are acceptable.

22.3.2 Certificates of Insurance confirming renewals of insurance shall be submitted to the **Commissioner** prior to the expiration date of coverage of policies required under this **Contract**. Such Certificates of Insurance shall comply with the requirements of Article 22.3.1(a) and, if applicable, Article 22.3.1(b).

22.3.3 The **Contractor** shall be obligated to provide the **City** with a copy of any policy required by this Article 22 upon the demand for such policy by the **Commissioner** or the New York City Law Department.

## 22.4 Operations of the Contractor:

22.4.1 The **Contractor** shall not commence the **Work** unless and until all required certificates have been submitted to and accepted by the **Commissioner**. Acceptance by the **Commissioner** of a certificate hereunder does not excuse the **Contractor** from securing a policy consistent with all provisions of this Article or of any liability arising from its failure to do so.

22.4.2 The **Contractor** shall be responsible for providing continuous insurance coverage in the manner, form, and limits required by this **Contract** and shall be authorized to perform **Work** only during the effective period of all required coverage.

22.4.3 In the event that any of the required insurance policies lapse, are revoked, suspended or otherwise terminated, for whatever cause, the **Contractor** shall immediately stop all **Work**, and shall not recommence **Work** until authorized in writing to do so by the **Commissioner**. Upon quitting the **Site**, except as otherwise directed by the **Commissioner**, the **Contractor** shall leave all plant, materials, equipment, tools and supplies on the **Site**. **Contract** time shall continue to run during such periods and no extensions of time will be granted. The **Commissioner** may also declare the **Contractor** in default for failure to maintain required insurance.

22.5 The **City** as Additional Insured or Loss Payee under **Subcontractors'** Insurance. The **Contractor** shall ensure that each **Subcontractor** name the **City** as Additional Insured or loss payee, as appropriate, under all

policies covering **Work** performed by such **Subcontractor** under this **Contract**. The **City's** coverage as **Additional Insured** shall include the **City's** officials and employees and be at least as broad as that provided to the **Contractor**. The foregoing requirements shall not apply to insurance provided pursuant to Articles 22.1.2, 22.1.3, and 22.1.4.

22.6 Wherever reference is made in Article 7 or this Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth in Schedule A of the General Conditions. In the event no address is set forth in Schedule A, such documents are to be sent to the **Commissioner's** address as provided elsewhere in this **Contract**.

22.7 If the **Contract** involves disposal of hazardous materials, the **Contractor** shall dispose such materials only at sites where the disposal site operator maintains Pollution Legal Liability Insurance in the amount of at least \$2,000,000 for losses arising from such disposal site.

22.8 **Materiality/Non-Waiver:** The **Contractor's** failure to secure policy(ies) in complete conformity with this Article, or to give the Insurance Company timely notice of any sort required in this **Contract** on behalf of the **City**, or to do anything else required by this Article shall constitute a material breach of this **Contract**. Such breach shall not be waived or otherwise excused by any action or inaction by the **City** at any time.

22.9 **Other Remedies:** Insurance coverage in the minimum amounts provided for herein shall not relieve the **Contractor** or **Subcontractors** of any liability under this **Contract**, nor shall it preclude the **City** from exercising any rights or taking such other actions as are available to it under any other provisions of this **Contract** or **Law**.

### **ARTICLE 23. MONEY RETAINED AGAINST CLAIMS**

23.1 If any claim shall be made by any person or entity (including **Other Contractors** with the **City** on this **Project**) against the **City** or against the **Contractor** and the **City** for any of the following:

(a) An alleged loss, damage, injury, theft or vandalism of any of the kinds referred to in Articles 7 and 12, plus the reasonable costs of defending the **City**, which in the opinion of the **Comptroller** may not be paid by an insurance company (for any reason whatsoever); or

(b) An infringement of copyrights, patents or use of patented articles, tools, etc., as referred to in Article 57; or

(c) Damage claimed to have been caused directly or indirectly by the failure of the **Contractor** to perform the **Work** in strict accordance with this **Contract**,

the amount of such claim, or so much thereof as the **Comptroller** may deem necessary, may be withheld by the **Comptroller**, as security against such claim, from any money due hereunder. The **Comptroller**, in his/her discretion, may permit the **Contractor** to substitute other satisfactory security in lieu of the monies so withheld.

23.2 If an action on such claim is timely commenced and the liability of the **City**, or the **Contractor**, or both, shall have been established therein by a final judgment of a Court of competent jurisdiction, or if such claim shall have been admitted by the **Contractor** to be valid, the **Comptroller** shall pay such judgment or admitted claim out of the monies retained by the **Comptroller** under the provisions of this article, and return the balance, if any, without interest, to the **Contractor**.

23.3 **Liens:** If at any time before or within thirty (30) **Days** after the **Work** is completed and accepted by the **City**, any persons claiming to have performed any labor or furnished any material toward the performance or completion of this **Contract**, shall file with the **Agency** and with the **Treasurer** any notice as is described in the

New York State Lien Law, or any act of the Legislature of the State of New York, the City shall retain, from the monies due or to become due under this **Contract**, so much of such monies as shall be sufficient to pay the amount claimed in said notice, together with the reasonable costs of any action or actions brought or that may be brought to enforce such lien. The monies so retained shall be held by the City until the lien thereon created by the said act and the filing of the said notice shall be discharged pursuant to Law.

#### **ARTICLE 24. MAINTENANCE AND GUARANTY**

24.1 The **Contractor** shall promptly repair, replace, restore or rebuild, as the **Commissioner** may determine, any finished **Work** in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of **Substantial Completion** (or use and occupancy in accordance with Article 16), except where other periods of maintenance and guarantee are provided for.

24.2 As security for the faithful performance of its obligations hereunder, the **Contractor**, upon filing its requisition for payment on **Substantial Completion**, shall deposit with the **Commissioner** a sum equal to one (1%) percent of the price (or the amount fixed in Schedule A of the General Conditions) in cash or certified check upon a state or national bank and trust company or a check of such bank and trust company signed by a duly authorized officer thereof and drawn to the order of the **Comptroller**, or obligations of the City, which the **Comptroller** may approve as of equal value with the sum so required.

24.3 In lieu of the above, the **Contractor** may make such security payment to the City by authorizing the **Commissioner** in writing to deduct the amount from the **Substantial Completion** payment which shall be deemed the deposit required above.

24.4 If the **Contractor** has faithfully performed all of its obligations hereunder the **Commissioner** shall so certify to the **Comptroller** within five (5) **Days** after the expiration of one (1) year from the date of **Substantial Completion** and acceptance of the **Work** or within thirty (30) **Days** after the expiration of the guarantee period fixed in the **Specifications**. The security payment shall be repaid to the **Contractor** without interest within thirty (30) **Days** after certification by the **Commissioner** to the **Comptroller** that the **Contractor** has faithfully performed all of its obligations hereunder.

24.5 Notice by the **Commissioner** to the **Contractor** to repair, replace, rebuild or restore such defective or damaged **Work** shall be timely, pursuant to this article, if given not later than ten (10) **Days** subsequent to the expiration of the one (1) year period or other periods provided for herein.

24.6 If the **Contractor** shall fail to repair, replace, rebuild or restore such defective or damaged **Work** promptly after receiving such notice, the **Commissioner** shall have the right to have the **Work** done by others in the same manner as provided for in the completion of a defaulted **Contract**, under Article 51.

24.7 If the security payment so deposited is insufficient to cover the cost of such **Work**, the **Contractor** shall be liable to pay such deficiency on demand by the **Commissioner**.

24.8 The **Engineer's** certificate setting forth the fair and reasonable cost of repairing, replacing, rebuilding or restoring any damaged or defective **Work** when performed by one other than the **Contractor**, shall be binding and conclusive upon the **Contractor** as to the amount thereof.

24.9 The **Contractor** shall obtain all manufacturers' warranties and guaranties of all equipment and materials required by this **Contract** in the name of the City and shall deliver same to the **Commissioner**. All of the City's rights and title and interest in and to said manufacturers' warranties and guaranties may be assigned by the City to any subsequent purchasers or lessees of the premises.

**CHAPTER VI**  
**CHANGES, EXTRA WORK AND DOCUMENTATION OF CLAIM**

**ARTICLE 25. CHANGES**

25.1 Changes may be made to this **Contract** only as duly authorized in writing by the **Commissioner** in accordance with the **Laws** and this **Contract**. All such changes, modifications and amendments will become a part of the **Contract**. Work so ordered shall be performed by the **Contractor**.

25.2 **Contract** changes will be made only for **Work** necessary to complete the **Work** included in the original scope of the **Contract** and/or for non-material changes to the scope of the **Contract**. Changes are not permitted for any material alteration in the scope of **Work** in the **Contract**.

25.3 The **Contractor** shall be entitled to a price adjustment for **Extra Work** performed pursuant to a written change order. Adjustments to price shall be computed in one or more of the following ways:

25.3.1 By applicable unit prices specified in the **Contract**; and/or

25.3.2 By agreement of a fixed price; and/or

25.3.3 By time and material records; and/or

25.3.4 In any other manner approved by the **CCPO**.

25.4 All payments for change orders are subject to pre-audit by the **Engineering Audit Officer** and may be post-audited by the **Comptroller** and/or the **Department**.

**ARTICLE 26. METHODS OF PAYMENT FOR OVERRUNS AND EXTRA WORK**

26.1 **Overrun of Unit Price Item**: An overrun is any quantity of a unit price item which the **Contractor** is directed to provide which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule.

26.1.1 For any unit price item, the **Contractor** will be paid at the unit price bid for any quantity up to one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule. If during the progress of the **Work**, the actual quantity of any unit price item required to complete the **Work** approaches the estimated quantity for that item, and for any reason it appears that the actual quantity of any unit price item necessary to complete the **Work** will exceed the estimated quantity for that item by twenty-five (25%) percent, the **Contractor** shall immediately notify the **Engineer** of such anticipated overrun. The **Contractor** shall not be compensated for any quantity of a unit price item provided which is in excess of one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule without written authorization from the **Engineer**.

26.1.2 If the actual quantity of any unit price item necessary to complete the **Work** will exceed one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule, the **City** reserves the right and the **Contractor** agrees to negotiate a new unit price for such item. In no event shall such negotiated new unit price exceed the unit bid price. If the **City** and **Contractor** cannot agree on a new unit price, then the **City** shall order the **Contractor** and the **Contractor** agrees to provide additional quantities of the item on a time and material basis for the actual and reasonable cost as determined under Article 26.2, but in no event at a unit price exceeding the unit price bid.

**26.2 Extra Work:** For **Extra Work** where payment is by agreement on a fixed price in accordance with Article 25.3.2, the price to be paid for such **Extra Work** shall be based on the fair and reasonable estimated cost of the items set forth below. For **Extra Work** where payment is on a time and material basis in accordance with Article 25.3.3, the price to be paid for such **Extra Work** shall be the actual and reasonable cost of the items set forth below.

26.2.1 Necessary materials (including transportation to the Site); plus

26.2.2 Necessary direct labor, including payroll taxes and supplemental benefits; plus

26.2.3 Sales and personal property taxes, if any, required to be paid on materials not incorporated into such **Extra Work**; plus

26.2.4 Reasonable rental value of **Contractor**-owned, necessary plant and equipment other than small tools, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per operating hour:  $(.035) \times (\text{HP rating}) \times (\text{Fuel cost/gallon})$ . Reasonable rental value is defined as the lower of either seventy-five percent of the monthly prorated rental rates established in "The AED Green Book, Rental Rates and Specifications for Construction Equipment" published by PRIMEDIA (the "Green Book"), or seventy-five percent of the monthly prorated rental rates established in the "Rental Rate Blue Book for Construction Equipment" published by PRIMEDIA (the "Blue Book"). The reasonable rental value is inclusive of all operating costs except for fuel/energy consumption and equipment operator's wages/costs. For multiple shift utilization, reimbursement shall be calculated as follows: first shift shall be seventy-five percent of such rental rates; second shift shall be sixty percent of the first shift rate; and third shift shall be forty percent of the first shift rate. Equipment on standby shall be reimbursed at one-third the prorated monthly rental rate. **Contractor**-owned equipment includes equipment from rental companies affiliated with or controlled by the **Contractor**, as determined by the **Commissioner**. In establishing cost reimbursement for non-operating contractor-owned equipment (scaffolding, sheeting systems, road plates, etc.), the City may restrict reimbursement to a purchase-salvage/life cycle basis if less than the computed rental costs; plus

26.2.5 Necessary installation and dismantling of such plant and equipment, including transportation to and from the Site, if any, provided that, in the case of non-**Contractor**-owned equipment rented from a third party, the cost of installation and dismantling are not allowable if such costs are included in the rental rate; plus

26.2.6 Reasonable rental costs of non-**Contractor**-owned necessary plant and equipment other than small tools, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per hour of operation:  $(.035) \times (\text{HP rating}) \times (\text{Fuel cost/gallon})$ . In lieu of renting, the City reserves the right to direct the purchase of non-operating equipment (scaffolding, sheeting systems, road plates, etc.), with payment on a purchase-salvage/life cycle basis, if less than the projected rental costs; plus

26.2.7 Workers' compensation insurance, and any insurance coverage expressly required by the City for the performance of the **Extra Work** which is different than the types of insurance required by Article 22 and Schedule A of the General Conditions. The cost of workers' compensation insurance shall be based upon the Manual Rate for such insurance for the applicable work classifications/codes, in accordance with the most recent schedule promulgated by the New York Compensation Insurance Rating Board; plus

26.2.8 Additional costs incurred as a result of the **Extra Work** for performance and payment bonds; plus

26.2.9 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5 as compensation for overhead, except that no percentage for overhead will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes. Overhead shall include without limitation, all costs and expenses in connection with administration, management superintendence, small tools, and insurance required by Schedule A of the General Conditions other than workers' compensation insurance; plus

26.2.10 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5, plus item 26.2.9, as compensation for profit, except that no percentage for profit will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes; plus

26.2.11 Five (5%) percent of the total of items in Article 26.2.6, 26.2.7, and 26.2.8 as compensation for overhead and profit.

26.3 Where the **Extra Work** is performed in whole or in part by other than the **Contractor's** own forces pursuant to Article 26.2, the **Contractor** shall be paid, subject to pre-audit by the **Engineering Audit Officer**, the cost of such **Work** computed in accordance with Article 26.2 above, plus an additional allowance of five (5%) percent to cover the **Contractor's** overhead and profit.

26.4 Where a change is ordered, involving both **Extra Work** and omitted or reduced **Contract Work**, the **Contract** price shall be adjusted, subject to pre-audit by the **EAO**, in an amount based on the difference between the cost of such **Extra Work** and of the omitted or reduced **Work**. The cost of such **Extra Work** and of such omitted or reduced **Work** shall be computed based upon applicable **Contract** unit prices. Where there are no applicable **Contract** unit prices, the cost of such **Extra Work** and of such omitted or reduced **Contract Work** shall be computed in accordance with items 26.2.1 through 26.2.8. If the cost of such **Extra Work** exceeds the costs of such omitted or reduced **Contract Work**, the **Contract** price shall be increased by the difference, plus percentages for overhead and profit as provided in Articles 26.2.9 through 26.2.11. If the cost of the omitted or reduced **Contract Work** exceeds the cost of the **Extra Work**, then the **Contract** price shall be reduced by the difference.

26.5 Where the **Contractor** and the **Commissioner** can agree upon a fixed price for **Extra Work** in accordance with Article 25.3.2 or another method of payment for **Extra Work** in accordance with Article 25.3.4, or for **Extra Work** ordered in connection with omitted work, such method, subject to pre-audit by the **EAO**, may, at the option of the **Commissioner**, be substituted for the cost plus a percentage method provided in Article 26.2; provided, however, that if the **Extra Work** is performed by a **Subcontractor**, the **Contractor** shall not be entitled to receive more than an additional allowance of five (5%) percent for overhead and profit over the cost of such **Subcontractor's Work** as computed in accordance with Article 26.2.

## **ARTICLE 27. RESOLUTION OF DISPUTES**

27.1 All disputes between the **City** and the **Contractor** of the kind delineated in this article that arise under, or by virtue of, this **Contract** shall be finally resolved in accordance with the provisions of this article and the **PPB Rules**. This procedure for resolving all disputes of the kind delineated herein shall be the exclusive means of resolving any such disputes.

27.1.1 This article shall not apply to disputes concerning matters dealt with in other sections of the **PPB Rules**, or to disputes involving patents, copyrights, trademarks, or trade secrets (as interpreted by the courts of New York State) relating to proprietary rights in computer software.

27.1.2 This article shall apply only to disputes about the scope of work delineated by the **Contract**, the interpretation of **Contract** documents, the amount to be paid for **Extra Work** or disputed work performed in connection with the **Contract**, the conformity of the **Contractor's Work** to the



**Contract**, and the acceptability and quality of the **Contractor's Work**; such disputes arise when the **Engineer, Resident Engineer, Engineering Audit Officer**, or other designee of the **Commissioner** makes a determination with which the **Contractor** disagrees.

27.2 All determinations required by this article shall be made in writing clearly stated, with a reasoned explanation for the determination based on the information and evidence presented to the party making the determination. Failure to make such determination within the time required by this article shall be deemed a non-determination without prejudice that will allow application to the next level.

27.3 During such time as any dispute is being presented, heard, and considered pursuant to this article, the **Contract** terms shall remain in force and the **Contractor** shall continue to perform **Work** as directed by the **ACCO** or the **Engineer**. Failure of the **Contractor** to continue **Work** as directed shall constitute a waiver by the **Contractor** of its claim.

#### 27.4 Presentation of Disputes to Commissioner.

Notice of Dispute and Agency Response. The **Contractor** shall present its dispute in writing ("Notice of Dispute") to the **Commissioner** within thirty (30) Days of receiving written notice of the determination or action that is the subject of the dispute. This notice requirement shall not be read to replace any other notice requirements contained in the **Contract**. The Notice of Dispute shall include all the facts, evidence, documents, or other basis upon which the **Contractor** relies in support of its position, as well as a detailed computation demonstrating how any amount of money claimed by the **Contractor** in the dispute was arrived at. Within thirty (30) Days after receipt of the detailed written submission comprising the complete Notice of Dispute, the **Engineer, Resident Engineer, Engineering Audit Officer**, or other designee of the **Commissioner** shall submit to the **Commissioner** all materials he or she deems pertinent to the dispute. Following initial submissions to the **Commissioner**, either party may demand of the other the production of any document or other material the demanding party believes may be relevant to the dispute. The requested party shall produce all relevant materials that are not otherwise protected by a legal privilege recognized by the courts of New York State. Any question of relevancy shall be determined by the **Commissioner** whose decision shall be final. Willful failure of the **Contractor** to produce any requested material whose relevancy the **Contractor** has not disputed, or whose relevancy has been affirmatively determined, shall constitute a waiver by the **Contractor** of its claim.

27.4.1 **Commissioner Inquiry.** The **Commissioner** shall examine the material and may, in his or her discretion, convene an informal conference with the **Contractor**, the **ACCO**, and the **Engineer, Resident Engineer, Engineering Audit Officer**, or other designee of the **Commissioner** to resolve the issue by mutual consent prior to reaching a determination. The **Commissioner** may seek such technical or other expertise as he or she shall deem appropriate, including the use of neutral mediators, and require any such additional material from either or both parties as he or she deems fit. The **Commissioner's** ability to render, and the effect of, a decision hereunder shall not be impaired by any negotiations in connection with the disputed presented, whether or not the **Commissioner** participated therein. The **Commissioner** may or, at the request of any party to the dispute, shall compel the participation of any other **Contractor** with a **Contract** related to the **Work** of this **Contract**, and that **Contractor** shall be bound by the decision of the **Commissioner**. Any **Contractor** thus brought into the dispute resolution proceeding shall have the same rights and obligations under this article as the **Contractor** initiating the dispute.

27.4.2 **Commissioner Determination.** Within thirty (30) days after the receipt of all materials and information, or such longer time as may be agreed to by the parties, the **Commissioner** shall make his or her determination and shall deliver or send a copy of such determination to the **Contractor**, the **ACCO**, and **Engineer, Resident Engineer, Engineering Audit Officer**, or other designee of the **Commissioner**, as applicable, together with a statement concerning how the decision may be appealed.

**27.4.3 Finality of Commissioner Decision.** The Commissioner's decision shall be final and binding on all parties, unless presented to the Contract Dispute Resolution Board pursuant to this article. The City may not take a petition to the Contract Dispute Resolution Board. However, should the Contractor take such a petition, the City may seek, and the Contract Dispute Resolution Board may render, a determination less favorable to the Contractor and more favorable to the City than the decision of the Commissioner.

**27.5 Presentation of Dispute to the Comptroller.** Before any dispute may be brought by the Contractor to the Contract Dispute Resolution Board, the Contractor must first present its claim to the Comptroller for his or her review, investigation, and possible adjustment.

**27.5.1 Time, Form, and Content of Notice.** Within thirty (30) days of its receipt of a decision by the Commissioner, the Contractor shall submit to the Comptroller and to the Commissioner a Notice of Claim regarding its dispute with the Agency. The Notice of Claim shall consist of (i) a brief Written statement of the substance of the dispute, the amount of money, if any, claimed and the reason(s) the Contractor contends the dispute was wrongly decided by the Commissioner; (ii) a copy of the written decision of the Commissioner; and (iii) a copy of all materials submitted by the Contractor to the Agency, including the Notice of Dispute. The Contractor may not present to the Comptroller any material not presented to the Commissioner, except at the request of the Comptroller.

**27.5.2 Agency Response.** Within thirty (30) days of receipt of the Notice of Claim, the Agency shall make available to the Comptroller a copy of all material submitted by the Agency to the Commissioner in connection with the dispute. The Agency may not present to the Comptroller any material not presented to the Commissioner except at the request of the Comptroller.

**27.5.3 Comptroller Investigation.** The Comptroller may investigate the claim in dispute and, in the course of such investigation, may exercise all powers provided in section 7-201 and 7-203 of the New York City Administrative Code. In addition, the Comptroller may demand of either party, and such party shall provide, whatever additional material the Comptroller deems pertinent to the claim, including original business records of the Contractor. Willful failure of the Contractor to produce within fifteen (15) days any material requested by the Comptroller shall constitute a waiver by the Contractor of its claim. The Comptroller may also schedule an informal conference to be attended by the Contractor, Agency representatives, and any other personnel desired by the Comptroller.

**27.5.4 Opportunity of Comptroller to Compromise or Adjust Claim.** The Comptroller shall have forty-five (45) days from his or her receipt of all materials referred to in Article 27.5.3 to investigate the disputed claim. The period for investigation and compromise may be further extended by agreement between the Contractor and the Comptroller, to a maximum of ninety (90) days from the Comptroller's receipt of all materials. The Contractor may not present its petition to the Contract Dispute Resolution Board until the period for investigation and compromise delineated in Article 27.5.4 has expired. In compromising or adjusting any claim hereunder, the Comptroller may not revise or disregard the terms of the Contract between the parties.

**27.6 Contract Dispute Resolution Board.** There shall be a Contract Dispute Resolution Board composed of:

**27.6.1** The chief administrative law judge of the Office of Administrative Trials and Hearings (OATH) or his/her designated OATH administrative law judge, who shall act as chairperson, and may adopt operational procedures and issue such orders consistent with this article as may be necessary in the execution of the Contract Dispute Resolution Board's functions, including, but not limited to, granting extensions of time to present or respond to submissions;

27.6.1.1 The **CCPO** or his/her designee; any designee shall have the requisite background to consider and resolve the merits of the dispute and shall not have participated personally and substantially in the particular matter that is the subject of the dispute or report to anyone who so participated; and

27.6.2 A person with appropriate expertise who is not an employee of the City. This person shall be selected by the presiding administrative law judge from a prequalified panel of individuals, established and administered by OATH with appropriate background to act as decision-makers in a dispute. Such individual may not have a contract or dispute with the City or be an officer or employee of any company or organization that does, or regularly represents persons, companies, or organizations having disputes with the City.

27.7 Petition to the Contract Dispute Resolution Board. In the event the claim has not been settled or adjusted by the **Comptroller** within the period provided in this article, the **Contractor**, within thirty (30) days thereafter, may petition the Contract Dispute Resolution Board to review the **Commissioner's** determination.

27.7.1 Form and Content of Petition by **Contractor**. The **Contractor** shall present its dispute to the Contract Dispute Resolution Board in the form of a petition, which shall include (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed, and the reason(s) the **Contractor** contends the dispute was wrongly decided by the **Commissioner**; (ii) a copy of the written Decision of the **Commissioner**, (iii) copies of all materials submitted by the **Contractor** to the Agency; (iv) a copy of the written decision of the **Comptroller**, if any, and (v) copies of all correspondence with, or written material submitted by the **Contractor**, to the **Comptroller**. The **Contractor** shall concurrently submit four (4) complete sets of the Petition: one set to the Corporation Counsel (Attn: Commercial and Real Estate Litigation Division) and three (3) sets to the Contract Dispute Resolution Board at OATH's offices with proof of service on the Corporation Counsel. In addition, the **Contractor** shall submit a copy of the written statement of the substance of the dispute, cited in (i) above, to both the **Commissioner** and the **Comptroller**.

27.7.2 Agency Response. Within thirty (30) Days of its receipt of the petition by the Corporation Counsel, the **Agency** shall respond to the brief written statement of the **Contractor** and make available to the Contract Dispute Resolution Board all material it submitted to the **Commissioner** and **Comptroller**. Three (3) complete copies of the **Agency** response shall be provided to the Contract Dispute Resolution Board and one to the **Contractor**. Extensions of time for submittal of the **Agency** response shall be given as necessary upon a showing of good cause or, upon consent of the parties, for an initial period of up to thirty (30) Days.

27.7.3 Further Proceedings. The Contract Dispute Resolution Board shall permit the **Contractor** to present its case by submission of memoranda, briefs, and oral argument. The Contract Dispute Resolution Board shall also permit the **Agency** to present its case in response to the **Contractor** by submission of memoranda, briefs, and oral argument. If requested by the Corporation Counsel, the **Comptroller** shall provide reasonable assistance in the preparation of the **Agency's** case. Neither the **Contractor** nor the **Agency** may support its case with any documentation or other material that was not considered by the **Comptroller**, unless requested by the Contract Dispute Resolution Board. The Contract Dispute Resolution Board, in its discretion, may seek such technical or other expert advice as it shall deem appropriate and may seek, on its own or upon application of a party, any such additional material from any party as it deems fit. The Contract Dispute Resolution Board, in its discretion, may combine more than one dispute between the parties for concurrent resolution.

27.7.4 Contract Dispute Resolution Board Determination. Within forty-five (45) Days of the conclusion of all written submissions and oral arguments, the Contract Dispute Resolution Board shall render a written decision resolving the dispute. In an unusually complex case, the Contract Dispute Resolution Board may render its decision in a longer period, not to exceed ninety (90) Days, and shall

so advise the parties at the commencement of this period. The Contract Dispute Resolution Board's decision must be consistent with the terms of the **Contract**. Decisions of the Contract Dispute Resolution Board shall only resolve matters before the Contract Dispute Resolution Board and shall not have precedential effect with respect to matters not before the Contract Dispute Resolution Board.

**27.7.5 Notification of Contract Dispute Resolution Board Decision.** The Contract Dispute Resolution Board shall send a copy of its decision to the **Contractor**, the **ACCO**, the **Engineer**, the **Comptroller**, the **Corporation Counsel**, the **Director of the Office of Construction**, and the **PPB**. A decision in favor of the **Contractor** shall be subject to the prompt payment provisions of the **PPB Rules**. The Required Payment Date shall be thirty (30) Days after the date the parties are formally notified of the Contract Dispute Resolution Board's decision.

**27.7.6 Finality of Contract Dispute Resolution Board Decision.** The Contract Dispute Resolution Board's decision shall be final and binding on all parties. Any party may seek review of the Contract Dispute Resolution Board's decision solely in the form of a challenge, filed within four (4) months of the date of the Contract Dispute Resolution Board's decision, in a court of competent jurisdiction of the State of New York, County of New York pursuant to Article 78 of the Civil Practice Laws and Rules. Such review by the court shall be limited to the question of whether or not the Contract Dispute Resolution Board's decision was made in violation of lawful procedure, was affected by an error of Law, or was arbitrary and capricious or an abuse of discretion. No evidence or information shall be introduced or relied upon in such proceeding that was not presented to the Contract Dispute Resolution Board in accordance with this article.

**27.8** Any termination, cancellation, or alleged breach of the **Contract** prior to or during the pendency of any proceedings pursuant to this article shall not affect or impair the ability of the **Commissioner** or Contract Dispute Resolution Board to make a binding and final decision pursuant to this article.

## **ARTICLE 28. RECORD KEEPING FOR EXTRA OR DISPUTED WORK**

**28.1** While the **Contractor** or any of its **Subcontractors** is performing **Extra Work** on a Time and Material Basis ordered by the **Commissioner** under Article 25, or is performing disputed **Work**, or complying with a determination or order under protest in accordance with Articles 27 and 30, in each such case the **Contractor** shall furnish the **Resident Engineer** daily with three (3) copies of written statements signed by the **Contractor's** representative at the **Site** showing:

**28.1.1** The name and number of each **Worker** employed on such **Work** or engaged in complying with such determination or order, the number of hours employed, and the character of the **Work** each is doing; and

**28.1.2** The nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such **Work** or compliance with such determination or order, and from whom purchased or rented.

**28.2** A copy of such statement will be countersigned by the **Resident Engineer**, noting thereon any items not agreed to or questioned, and will be returned to the **Contractor** within two (2) Days after submission.

**28.3** The **Contractor** and its **Subcontractors**, when required by the **Commissioner**, or the **Comptroller**, shall also produce for inspection, at the office of the **Contractor** or **Subcontractor**, any and all of its books, bid documents, financial statements, vouchers, records, daily job diaries and reports, and cancelled checks, and any other documents relating to showing the nature and quantity of the labor, materials, plant and equipment actually used in the performance of such **Work**, or in complying with such determination or order, and the amounts

expended therefor, and shall permit the **Commissioner** and the **Comptroller** to make such extracts therefrom, or copies thereof, as they or either of them may desire.

28.4 In connection with the examination provided for herein, the **Commissioner**, upon demand therefor, will produce for inspection by the **Contractor** such records as the **Agency** may have with respect to such **Extra** or disputed **Work** performed under protest pursuant to order of the **Commissioner**, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the **Contractor's** claim.

28.5 Failure to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation or damages on account of the performance of such **Work** or compliance with such determination or order.

#### **ARTICLE 29. OMITTED WORK**

29.1 If any **Contract Work** in a lump sum **Contract**, or if any part of a lump sum item in a unit price, lump sum, or percentage-bid **Contract** is omitted by the **Commissioner** pursuant to Article 33, the **Contract** price, subject to audit by the EAO, shall be reduced by a pro rata portion of the lump sum bid amount based upon the percent of **Work** omitted subject to Article 29.4. For the purpose of determining the pro rata portion of the lump sum bid amount, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be the determining factor.

29.2 If the whole of a lump sum item or units of any other item is so omitted by the **Commissioner** in a unit price, lump sum, or percentage-bid **Contract**, then no payment will be made therefor except as provided in Article 29.4.

29.3 For units that have been ordered but are only partially completed, the unit price shall be reduced by a pro rata portion of the unit price bid based upon the percentage of **Work** omitted subject to Article 29.4.

29.4 In the event the **Contractor**, with respect to any omitted **Work**, has purchased any non-cancelable material and/or equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated into the **Work**, the **Contractor** shall be paid for such material and/or equipment in accordance with Article 64.2.1(b); provided, however, such payment is contingent upon the **Contractor's** delivery of such material and/or equipment in acceptable condition to a location designated by the **City**.

29.5 The **Contractor** agrees to make no claim for damages or for loss of overhead and profit with regard to any omitted **Work**.

#### **ARTICLE 30. NOTICE AND DOCUMENTATION OF COSTS AND DAMAGES; PRODUCTION OF FINANCIAL RECORDS**

30.1 If the **Contractor** shall claim to be sustaining damages by reason of any act or omission of the **City** or its agents, it shall submit to the **Commissioner** within forty-five (45) **Days** from the time such damages are first incurred, and every thirty (30) **Days** thereafter for as long as such damages are incurred, verified statements of the details and the amounts of such damages, together with documentary evidence of such damages. The **Contractor** may submit any of the above statements within such additional time as may be granted by the **Commissioner** in writing upon written request therefor. Failure of the **Commissioner** to respond in writing to a written request for additional time within thirty (30) **Days** shall be deemed a denial of the request. On failure of the **Contractor** to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the **Contractor** may claim in any action or dispute resolution procedure arising under or by reason of this **Contract** shall not be different from or in excess of the statements and documentation made pursuant to this article.

30.2 In addition to the foregoing statements, the **Contractor** shall, upon notice from the **Commissioner**, produce for examination at the **Contractor's** office, by the **Engineer, Architect or Project Manager**, all of its books of account, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**, and submit itself and persons in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.3 In addition to the statements required under Article 28 and this Article, the **Contractor** and/or its **Subcontractor** shall, within thirty (30) **Days** upon notice from the **Commissioner** or **Comptroller**, produce for examination at the **Contractor's** and/or **Subcontractor's** office, by a representative of either the **Commissioner** or **Comptroller**, all of its books of account, bid documents, financial statements, accountant workpapers, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**. Further, the **Contractor** and/or its **Subcontractor** shall submit any person in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.4 Unless the information and examination required under Article 30.3 is provided by the **Contractor** and/or its **Subcontractor** upon thirty (30) **Days** notice from the **Commissioner** or **Comptroller**, or upon the **Commissioner's** or **Comptroller's** written authorization to extend the time to comply, the **City** shall be released from all claims arising under, relating to or by reason of this **Contract**, except for sums certified by the **Commissioner** or **Comptroller** to be due under the provisions of this **Contract**. It is further stipulated and agreed that no person has the power to waive any of the foregoing provisions and that in any action or dispute resolution procedure against the **City** to recover any sum in excess of the sums certified by the **Commissioner** or **Comptroller** to be due under or by reason of this **Contract**, the **Contractor** must allege in its complaint and prove, at trial or during such dispute resolution procedure, compliance with the provisions of this Article.

30.5 In addition, after the commencement of any action or dispute resolution procedure by the **Contractor** arising under or by reason of this **Contract**, the **City** shall have the right to require the **Contractor** to produce for examination under oath, up until the trial of the action or hearing before the **Contract Dispute Resolution Board**, the books and documents described in Article 30.3 and submit itself and all persons in its employ for examination under oath. If this Article is not complied with as required, then the **Contractor** hereby consents to the dismissal of the action or dispute resolution procedure.

## **CHAPTER VII**

### **POWERS OF THE RESIDENT ENGINEER, THE ENGINEER OR ARCHITECT AND THE COMMISSIONER**

#### **ARTICLE 31. THE RESIDENT ENGINEER**

31.1 The **Resident Engineer** shall have the power to inspect, supervise and control the performance of the **Work**, subject to review by the **Commissioner**. The **Resident Engineer** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

## **ARTICLE 32. THE ENGINEER OR ARCHITECT OR PROJECT MANAGER**

32.1 The **Engineer or Architect or Project Manager**, in addition to those matters elsewhere herein delegated to the **Engineer** and expressly made subject to his/her determination, direction or approval, shall have the power, subject to review by the **Commissioner**:

32.1.1 To determine the amount, quality, and location of the **Work** to be paid for hereunder; and

32.1.2 To determine all questions in relation to the **Work**, to interpret the **Contract Drawings, Specifications, and Addenda**, and to resolve all patent inconsistencies or ambiguities therein; and

32.1.3 To determine how the **Work** of this **Contract** shall be coordinated with **Work** of other **Contractors** engaged simultaneously on this **Project**, including the power to suspend any part of the **Work**, but not the whole thereof; and

32.1.4 To make minor changes in the **Work** as he/she deems necessary, provided such changes do not result in a net change in the cost to the **City** or to the **Contractor** of the **Work** to be done under the **Contract**; and

32.1.5 To amplify the **Contract Drawings**, add explanatory information and furnish additional **Specifications** and drawings, consistent with this **Contract**.

32.2 The foregoing enumeration shall not imply any limitation upon the power of the **Engineer or Architect or Project Manager**, for it is the intent of this **Contract** that all of the **Work** shall generally be subject to his/her determination, direction and approval, except where the determination, direction or approval of someone other than the **Engineer or Architect or Project Manager** is expressly called for herein.

32.3 The **Engineer or Architect or Project Manager** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

## **ARTICLE 33. THE COMMISSIONER**

33.1 The **Commissioner**, in addition to those matters elsewhere herein expressly made subject to his/her determination, direction or approval, shall have the power:

33.1.1 To review and make determinations on any and all questions in relation to this **Contract** and its performance; and

33.1.2 To modify or change this **Contract** so as to require the performance of **Extra Work** (subject, however, to the limitations specified in Article 25) or the omission of **Contract Work**; and

33.1.3 To suspend the whole or any part of the **Work** whenever in his/her judgment such suspension is required:

33.1.3(a) In the interest of the **City** generally; or

33.1.3(b) To coordinate the **Work** of the various **Contractors** engaged on this **Project** to the provisions of Article 12; or

33.1.3(c) To expedite the completion of the entire **Project** even though the completion of this particular **Contract** may thereby be delayed.

## **ARTICLE 34. NO ESTOPPEL**

34.1 Neither the City nor any Agency, officer, agent or employee thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this Contract by the City, the Commissioner, the Resident Engineer, or any other officer, agent or employee of the City, either before or after the final completion and acceptance of the Work and payment therefor:

34.1.1 From showing the true and correct classification, amount, quality or character of the Work actually done; or that any such determination, decision, order, letter, payment or certificate was untrue, incorrect or improperly made in any particular, or that the Work, or any part thereof, does not in fact conform to the requirements of this Contract; and

34.1.2 From demanding and recovering from the Contractor any overpayment made to it, or such damages as the City may sustain by reason of the Contractor's failure to perform each and every part of its Contract.

## **CHAPTER VIII LABOR PROVISIONS**

## **ARTICLE 35. EMPLOYEES**

35.1 The Contractor and its Subcontractors shall not employ on the Work:

35.1.1 Anyone who is not competent, faithful and skilled in the Work for which he/she shall be employed; and whenever the Commissioner shall inform the Contractor, in writing, that any employee is, in his/her opinion, incompetent, unfaithful or disobedient, that employee shall be discharged from the Work forthwith, and shall not again be employed upon it; or

35.1.2 Any labor, materials or means whose employment, or utilization during the course of this Contract, may tend to or in any way cause or result in strikes, work stoppages, delays, suspension of Work or similar troubles by workers employed by the Contractor or its Subcontractors, or by any of the trades working in or about the buildings and premises where Work is being performed under this Contract, or by Other Contractors or their Subcontractors pursuant to other Contracts, or on any other building or premises owned or operated by the City, its Agencies, departments, boards or authorities. Any violation by the Contractor of this requirement may, upon certification of the Commissioner, be considered as proper and sufficient cause for declaring the Contractor to be in default, and for the City to take action against it as set forth in Chapter X of this Contract, or such other article of this Contract as the Commissioner may deem proper; or

35.1.3 In accordance with Section 220.3-e of the Labor Law of the State of New York (hereinafter "Labor Law"), the Contractor and its Subcontractors shall not employ on the Work any apprentice, unless he/she is a registered individual, under a bona fide program registered with the New York State Department of Labor. The allowable ratio of apprentices to journey-level workers in any craft classification shall not be greater than the ratio permitted to the Contractor as to its Work force on any job under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the Comptroller of the City for the classification of Work actually performed. The Contractor or Subcontractor will be required to furnish written evidence of the registration of its program and apprentices as well as all the appropriate ratios and wage rates, for the area of the construction prior to using any apprentices on the Contract Work.



35.2 If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand dollars, all laborers, workers, and mechanics employed in the performance of the **Contract** on the public work site, either by the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States department of labor's occupational safety and health administration that is at least ten hours in duration.

#### **ARTICLE 36. NO DISCRIMINATION**

36.1 The **Contractor** specifically agrees, as required by Labor Law Section 220-e, as amended, that:

36.1.1 In the hiring of employees for the performance of **Work** under this **Contract** or any subcontract hereunder, neither the **Contractor**, **Subcontractor**, nor any person acting on behalf of such **Contractor** or **Subcontractor**, shall by reason of race, creed, color or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the **Work** to which the employment relates;

36.1.2 Neither the **Contractor**, **Subcontractor**, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this **Contract** on account of race, creed, color or national origin;

36.1.3 There may be deducted from the amount payable to the **Contractor** by the **City** under this **Contract** a penalty of fifty (\$50.00) dollars for each person for each **Day** during which such person was discriminated against or intimidated in violation of the provisions of this **Contract**; and

36.1.4 This **Contract** may be cancelled or terminated by the **City** and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this article.

36.1.5 The aforesaid provisions of this article covering every **Contract** for or on behalf of the State or a municipality for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

36.2 The **Contractor** specifically agrees, as required by Section 6-108 of the Administrative Code, as amended, that:

36.2.1 It shall be unlawful for any person engaged in the construction, alteration or repair of buildings or engaged in the construction or repair of streets or highways pursuant to a **Contract** with the **City** or engaged in the manufacture, sale or distribution of materials, equipment or supplies pursuant to a **Contract** with the **City** to refuse to employ or to refuse to continue in any employment any person on account of the race, color or creed of such person.

36.2.2 It shall be unlawful for any person or any servant, agent or employee of any person, described in Article 36.1.2, to ask, indicate or transmit, orally or in writing, directly or indirectly, the race, color or creed or religious affiliation of any person employed or seeking employment from such person, firm or corporation.

36.2.3 Breach of the foregoing provisions shall be deemed a violation of a material provision of this **Contract**.

36.2.4 Any person, or the employee, manager or owner of or officer of such firm or corporation who shall violate any of the provisions of this section shall, upon conviction thereof, be punished by

a fine of not more than one hundred (\$100.00) dollars or by imprisonment for not more than thirty (30) Days, or both.

36.3 This **Contract** is subject to the requirements of Executive Order No. 50 (1980) ("E.O. 50"), as revised, and the Rules and Regulations promulgated thereunder. No **Contract** will be awarded unless and until these requirements have been complied with in their entirety. By signing this **Contract**, the **Contractor** agrees that it:

36.3.1 Will not engage in any unlawful discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, marital status or sexual orientation with respect to all employment decisions including, but not limited to, recruitment, hiring, upgrading, demotion, downgrading, transfer, training, rates of pay or other forms of compensation, layoff, termination, and all other terms and conditions of employment; and

36.3.2 Will not engage in any unlawful discrimination in the selection of **Subcontractors** on the basis of the owner's race, color, creed, national origin, sex, age, disability, marital status or sexual orientation; and

36.3.3 Will state in all solicitations or advertisements for employees placed by or on behalf of the **Contractor** that all qualified applicants will receive consideration for employment without unlawful discrimination based on race, creed, color, national origin, sex, age, citizens status, disability, marital status, sexual orientation, or that it is an equal employment opportunity employer; and

36.3.4 Will send to each labor organization or representative of workers with which it has a Collective Bargaining Agreement or other **Contract** or memorandum of understanding, written notification of its equal employment opportunity commitments under E.O. 50 and the Rules and Regulations promulgated thereunder; and

36.3.5 Will furnish all information and reports including an Employment Report before the award of the **Contract** which are required by E.O. 50, the Rules and Regulations promulgated thereunder, and orders of the Department of Business Services, Division of Labor Services ("**DLS**") and will permit access to its books, records and accounts by the **DLS** for the purposes of investigation to ascertain compliance with such rules, regulations, and orders.

36.4 The **Contractor** understands that in the event of its noncompliance with the nondiscrimination clauses of this **Contract** or with any of such rules, regulations, or orders, such noncompliance shall constitute a material breach of this **Contract** and noncompliance with E.O. 50 and the Rules and Regulations promulgated thereunder. After a hearing held pursuant to the rules of the **DLS**, the Director of the **DLS** may direct the **Commissioner** to impose any or all of the following sanctions:

36.4.1 Disapproval of the **Contractor**; and/or

36.4.2 Suspension or termination of the **Contract**; and/or

36.4.3 Declaring the **Contractor** in default; and/or

36.4.4 In lieu of any of the foregoing sanctions, the Director of the **DLS** may impose an employment program.

Failure to comply with E.O. 50 and the rules and regulations promulgated thereunder, in one or more instances, may result in the **Agency** declaring the **Contractor** to be non-responsible.

The **Contractor** further agrees that it will refrain from entering into any **Contract** or **Contract** modification subject to E.O. 50 and the rules and regulations promulgated thereunder with a **Subcontractor** who is not in compliance with the requirements of E.O. 50 and the rules and regulations promulgated thereunder.

36.5 The **Contractor** specifically agrees, as required by Section 6-123 of the Administrative Code, that:

36.5.1 The **Contractor** will not engage in any unlawful discriminatory practice in violation of Title VIII of the Administrative Code;

36.5.2 every agreement between the **Contractor** and its **Subcontractors** in excess of \$50,000 shall include a provision that the **Subcontractor** shall not engage in any unlawful discriminatory practice as defined in title viii of the Administrative Code (Section 8-101 et. seq.); and

36.5.3 Any failure to comply with this Article 36.5 may subject the **Contractor** to the remedies set forth in Section 6-123 of the Administrative Code, including, where appropriate, sanctions such as withholding of payment, imposition of an employment program, finding the **Contractor** to be in default, cancellation of the **Contract**, or any other sanction or remedy provided by **Law** or **Contract**.

#### **ARTICLE 37. LABOR LAW REQUIREMENTS**

37.1 The **Contractor** shall strictly comply with all applicable provisions of the Labor Law, as amended. Such compliance is a material term of this **Contract**.

37.2 The **Contractor** specifically agrees, as required by Labor Law Section 220 and 220-d, as amended, that:

37.2.1 **Hours of Work:** No laborer, worker, or mechanic in the employ of the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the **Work** contemplated by this **Contract** shall be permitted or required to work more than eight (8) hours in any one (1) calendar **Day**, or more than five (5) **Days** in any one (1) week, except as provided in the Labor Law and in cases of extraordinary emergency including fire, flood, or danger to life or property, or in the case of national emergency when so proclaimed by the President of the United States of America.

37.2.2 In situations in which there are not sufficient laborers, workers and mechanics who may be employed to carry on expeditiously the **Work** contemplated by this **Contract** as a result of such restrictions upon the number of hours and days of labor, and the immediate commencement or prosecution or completion without undue delay of the **Work** is necessary for the preservation of the **Site** and/or for the protection of the life and limb of the persons using the same, such laborers, workers, and mechanics shall be permitted or required to work more than eight (8) hours in any one (1) **Day**; or five (5) **Days** in any one (1) week; provided, however, that upon application of any **Contractor**, the **Commissioner** shall have first certified to the Commissioner of Labor of the State of New York (hereinafter "**Commissioner of Labor**") that such public **Work** is of an important nature and that a delay in carrying it to completion would result in serious disadvantage to the public; and provided, further, that such **Commissioner of Labor** shall have determined that such an emergency does in fact exist as provided in Labor Law Section 220.2.

37.2.3 Failure of the **Commissioner** to make such a certification to the Commissioner of Labor shall not entitle the **Contractor** to damages for delay or for any cause whatsoever.

**37.2.4 Prevailing Rate of Wages:** The wages to be paid for a legal day's Work to laborers, workers, or mechanics employed upon the Work contemplated by this Contract or upon any materials to be used thereon shall not be less than the "prevailing rate of wage" as defined in Labor Law Section 220, and as fixed by the Comptroller in the attached Schedule of Wage Rates and in updated schedules thereof. The prevailing wage rates and supplemental benefits to be paid are those in effect at the time the Work is being performed.

**37.2.5 Requests for interpretation or correction in the Information for Bidders** includes all requests for clarification of the classification of trades to be employed in the performance of the Work under this Contract. In the event that a trade not listed in the Contract is in fact employed during the performance of this Contract, the Contractor shall be required to obtain from the Agency the prevailing wage rates and supplementary benefits for the trades used and to complete the performance of this Contract at the price at which the Contract was awarded.

**37.2.6 Minimum Wages:** Except for employees whose wage is required to be fixed pursuant to Labor Law Section 220, all persons employed by the Contractor and any Subcontractor in the manufacture or furnishing of the supplies, materials, or equipment, or the furnishing of work, labor, or services, used in the performance of this Contract, shall be paid, without subsequent deduction or rebate unless expressly authorized by Law, not less than the sum mandated by Law. Minimum wages shall be the rates fixed by Federal Law and regulations.

**37.3 Working Conditions:** No part of the Work, labor or services shall be performed or rendered by the Contractor in any plants, factories, buildings or surroundings or under working conditions which are unsanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of this Contract. Compliance with the safety, sanitary and factory inspection Laws of the state in which the Work is to be performed shall be prima facie evidence of compliance with this article.

**37.4 Prevailing Wage Enforcement:** The Contractor agrees to pay for all costs incurred by the City in enforcing prevailing wage requirements, including the cost of any investigation conducted by or on behalf of the Agency or the Comptroller, where the City discovers a failure to comply with any of the requirements of this Article 37 by the Contractor or its Subcontractor(s). The Contractor also agrees, that should it fail or refuse to pay for any such investigation, the Agency is hereby authorized to deduct from a Contractor's account an amount equal to the cost of such investigation.

**37.4.1** The Labor Law Section 220 and Section 220-d, as amended, provide that this Contract shall be forfeited and no sum paid for any Work done hereunder on a second conviction for willfully paying less than:

**37.4.1(a)** The stipulated wage scale as provided in Labor Law Section 220, as amended, or

**37.4.1(b)** Less than the stipulated minimum hourly wage scale as provided in Labor Law Section 220-d, as amended.

**37.4.2** For any breach or violation of either Working Conditions (Article 37.3) and Minimum Wages (Article 37.2.6), the party responsible therefore shall be liable to the City for liquidated damages, which may be withheld from any amounts due on any Contracts with the City of such party responsible, or may be recovered in suits brought by the Corporation Counsel in the name of the City, in addition to damage for any other breach of this Contract, a sum equal to the amount of any underpayment of wages due to any employee engaged in the performance of this Contract. In addition, the Commissioner shall have the right to cancel Contracts and enter into other Contracts for the completion of the original Contract, with or without public letting, and the original Contractor shall be liable for any additional cost. All sums withheld or recovered as deductions, rebates, refunds, or underpayment of wages hereunder, shall be held in a special deposit account and

shall be paid without interest, on order of the **Comptroller**, directly to the employees who have been paid less than minimum rates of pay as set forth herein and on whose account such sums were withheld or recovered, provided that no claims by employees for such payments shall be entertained unless made within two (2) years from the date of actual notice to the **Contractor** of the withholding or recovery of such sums by the **City**.

37.4.3 A determination by the **Comptroller** that a **Contractor** and/or its **Subcontractor** willfully violated Labor Law Section 220 will be forwarded to the **City's** five District Attorneys for review.

37.4.4 The **Contractor's** or **Subcontractor's** noncompliance with this article and Labor Law Section 220, may result in an unsatisfactory performance evaluation and the **Comptroller** may also find and determine that the **Contractor** or **Subcontractor** willfully violated the New York Labor Law.

37.4.4(a) An unsatisfactory performance evaluation for noncompliance with this article may result in a determination that the **Contractor** is a non-responsible bidder on subsequent procurements with the **City** and thus a rejection of a future award of a contract with the **City**, as well as any other sanctions provided for by Law.

37.4.4(b) Labor Law Section 220-b, as amended, provides that when two (2) final determinations have been rendered against a **Contractor** or **Subcontractor** within any consecutive six (6) year period determining that such **Contractor** or **Subcontractor** has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with the Labor Law and this article, whether such failures were concurrent or consecutive and whether or not such final determinations concerning separate public work projects are rendered simultaneously, such **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public work contract with the **City** for a period of five (5) years from the second final determination. If the final determination involves the falsification of payroll records or the kickback of wages or supplements, the **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public work contract with the **City** for a period of five (5) years from the first final determination.

37.4.4(c) Labor Law Section 220, as amended, provides that the **Contractor** or **Subcontractor** found to have violated this article may be directed to make payment of wages or supplements including interest found to be due, and the **Contractor** or **Subcontractor** may be directed to make payment of a further sum as a civil penalty in an amount not exceeding twenty-five (25%) percent of the total amount found to be due.

37.5 The **Contractor** and its **Subcontractors** shall within ten (10) Days after mailing of a Notice of Award or written order, post in prominent and conspicuous places in each and every plant, factory, building, and structure where employees of the **Contractor** and its **Subcontractors** engaged in the performance of this **Contract** are employed, notices furnished by the **City**, in relation to prevailing wages and supplements, minimum wages and other stipulations contained in Sections 220 and 220-h of the Labor Law, and the **Contractor** and its **Subcontractors** shall continue to keep such notices posted in such prominent and conspicuous places until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services required to be furnished or rendered under this **Contract**.

37.6 The **Contractor** shall strictly comply with all of the provisions of Articles 37.6.1 through 37.6.5, and provide for all workers, laborers or mechanics in its employ, the following:

37.6.1 **Notices Posted At Site:** Post, in a location designated by the **City**, schedules of prevailing wages and supplements for this **Project**, a copy of all re-determinations of such schedules for the

**Project**, the Workers' Compensation Law Section 51 notice, all other notices required by law to be posted at the Site, the City notice that this **Project** is a public works **Project** on which each worker is entitled to receive the prevailing wages and supplements for the occupation at which he or she is working, and all other notices which the City directs the **Contractor** to post. The **Contractor** shall provide a surface for such notices which is satisfactory to the City. The **Contractor** shall maintain and keep current such notices in a legible manner and shall replace any notice or schedule which is damaged, defaced, illegible or removed for any reason. The **Contractor** shall post such notices before commencing any **Work** on the Site and shall maintain such notices until all **Work** on the Site is complete; and

**37.6.2 Daily Site Sign-in Sheets:** Maintain daily Site sign-in sheets, and require that **Subcontractors** maintain daily Site sign-in sheets for its employees, which include blank spaces for an employee's name to be both printed and signed, job title, date started and Social Security number, the time the employee began **Work** and the time the employee left **Work**, until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services to be furnished or rendered under this **Contract** unless exception is granted by the Comptroller upon application by the Agency. In the alternative, subject to the approval of the CCPO, the **Contractor** and **Subcontractor** may maintain an electronic or biometric sign-in system, which provides the information required by this Article 37.6.2; and

**37.6.3 Individual Employee Information Notices:** Distribute a notice, to each worker, laborer or mechanic employed under this **Contract**, in a form provided by the Agency, that this **Project** is a public work project on which each worker, laborer or mechanic is entitled to receive the prevailing rate of wages and supplements for the occupation at which he or she is working. If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand dollars, such notice shall also include a statement that, that each worker, laborer or mechanic be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States department of labor's occupational safety and health administration that is at least ten hours in duration. Such notice shall be distributed to each worker before he or she starts performing any **Work** of this **Contract** and with the first paycheck after July first of each year. Worker, laborer or mechanic includes employees of the **Contractor** and all **Subcontractors** and all employees of suppliers entering the Site. At the time of distribution, the **Contractor** shall have each worker, laborer or mechanic sign a statement, in a form provided by the Agency, certifying that the worker has received the notice required by this article, which signed statement shall be maintained with the payroll records required by this **Contract**; and

**37.6.3.1** The **Contractor** and each **Subcontractor** shall notify each worker, laborer or mechanic employed under this **Contract** in writing of the prevailing rate of wages for their particular job classification. Such notification shall be given to every worker, laborer and mechanic on their first pay stub and with every pay stub thereafter; and

**37.6.4 Site Laminated Identification Badges:** Provide laminated identification badges which indicate the worker's, laborer's or mechanic's name, trade, employer's name and employment starting date (month/day/year). Further, require as a condition of employment on the Site, that each and every worker, laborer or mechanic wear the laminated identification badge at all times and that it may be seen by any representative of the City; and

**37.6.5 Language Other Than English Used On Site:** Provide the ACCO notice when three (3) or more employees (worker and/or laborer and/or mechanic) on the Site, at any time, speak a language other than English. The ACCO will then provide the **Contractor** the notices in Article 37.6.1 in that language or languages as may be required. The **Contractor** is responsible for all distributions under Article 37; and

37.6.6 Provision of Records: The **Contractor** and **Subcontractor(s)** shall produce within five (5) **Days** on the **Site** of the **Work** and upon a written order of the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, or the **Comptroller**, such records as are required to be kept by this Article 37.6; and

37.6.7 If this **Contract** is for an amount greater than \$1,000,000, checks issued by the **Contractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**). For any subcontract for an amount greater than \$750,000, checks issued by a **Subcontractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**); and

37.6.8 The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of Articles 37.6.1 through 37.6.7 may result in the **Commissioner** declaring the **Contractor** or **Subcontractor(s)** in default and/or the withholding of payments otherwise due under the **Contract**.

37.7 The **Contractor** and its **Subcontractors** shall keep such employment and payroll records as are required by Section 220 of the Labor Law.

37.8 At the time the **Contractor** makes application for each partial payment and for final payment, the **Contractor** shall submit to the **Commissioner** a written payroll certification, in the form provided by this **Contract**, of compliance with the prevailing wage, minimum wage and other provisions and stipulations required by Labor Law Section 220 and of compliance with the training requirements of Labor law section 220-h set forth in Article 35.2. This certification of compliance with the provisions of this article shall be a condition precedent to payment and no payment shall be made to the **Contractor** unless and until each such certification shall have been submitted to and received by the **Commissioner**.

37.9 This **Contract** is executed by the **Contractor** with the express warranty and representation that the **Contractor** is not disqualified under the provisions of Section 220 of the Labor Law for the award of the **Contract**.

37.10 Any breach or violation of any of the foregoing shall be deemed a breach or violation of a material provision of this **Contract**, and grounds for cancellation thereof by the **City**.

#### **ARTICLE 38. PAYROLL REPORTS**

38.1 The **Contractor** shall maintain on the **Site** the original payrolls or transcripts thereof which the **Contractor** and its **Subcontractor(s)** are required to maintain pursuant to Labor Law Section 220. The **Contractor** and **Subcontractor(s)** shall submit original payrolls or transcripts, subscribed and affirmed by it as true, with each and every payment requisition. The **Contractor** and **Subcontractor(s)** shall produce within five (5) **Days** on the **Site** of the **Work** and upon a written order of the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, or the **Comptroller**, such original payrolls or transcripts thereof, subscribed and affirmed by it as true, and the statements signed by each worker pursuant to this Chapter VIII. In addition, the **Contractor** and **Subcontractor(s)** shall furnish to the **Engineer** upon written demand any other information to satisfy the **Engineer** that this Chapter VIII and the Labor Law, as to the hours of employment and rates of wages, are being observed. The **Contractor** shall maintain the payrolls or transcripts thereof for six (6) years from the date of completion of the **Work** on this **Contract**.

38.2 When directed by the **Engineer**, the **Contractor** or **Subcontractor** shall provide the **Engineer** with an attendance sheet for each **Day** on which **Work** is performed on the **Site**. Such attendance sheet shall be in a form acceptable to the **Agency** and shall provide information for employees of the **Contractor** and **Subcontractor(s)**.

### **ARTICLE 39. DUST HAZARDS**

39.1 Should a harmful dust hazard be created in performing the **Work** of this **Contract**, for the elimination of which appliances or methods have been approved by the Board of Standards and Appeals of the City of New York, such appliances and methods shall be installed, maintained, and effectively operated during the continuance of such harmful dust hazard. Failure to comply with this provision after notice shall make this **Contract** void.

## **CHAPTER IX PARTIAL AND FINAL PAYMENTS**

### **ARTICLE 40. CONTRACT PRICE**

40.1 The City shall pay, and the Contractor agrees to accept, in full consideration for the Contractor's performance of the **Work** subject to the terms and conditions hereof, the lump sum price or unit prices which this **Contract** was awarded, plus the amount required to be paid for any **Extra Work** ordered by the Commissioner under Article 25, less credit for any **Work** omitted pursuant to Article 29.

### **ARTICLE 41. BID BREAKDOWN ON LUMP SUM**

41.1 Within fifteen (15) Days after the commencement date specified in the Notice to Proceed, unless otherwise directed by the **Resident Engineer**, the Contractor shall submit to the **Resident Engineer** a breakdown of its bid price, or of lump sums bid for items of the **Contract**, showing the various operations to be performed under the **Contract**, as directed in the progress schedule required under Article 9, and the value of each of such operations, the total of such items to equal the lump sum price bid. Said breakdown must be approved in writing by the **Resident Engineer**.

41.2 No partial payment will be approved until the Contractor submits a bid breakdown that is acceptable to the **Resident Engineer**.

41.3 The Contractor shall also submit such other information relating to the bid breakdown as directed by the **Resident Engineer**. Thereafter, the breakdown may be used only for checking the Contractor's applications for partial payments hereunder, but shall not be binding upon the City, the Commissioner, or the Engineer for any purpose whatsoever.

### **ARTICLE 42. PARTIAL PAYMENTS**

42.1 From time to time as the **Work** progresses satisfactorily, but not more often than once a month, the Contractor may submit to the Engineer a requisition for a partial payment in the prescribed form, which shall contain an estimate of the quantity and the fair value of the **Work** done during the payment period.

42.2 Partial payments may be made for materials, fixtures and equipment in advance of their actual incorporation in the **Work**, as the Commissioner may approve, and upon the terms and conditions set forth in the General Conditions.

42.3 The Contractor shall also submit to the Commissioner in connection with every application for partial payment a verified statement in the form prescribed by the Comptroller setting forth the information required under Labor Law Section 220-a.



42.4 Within thirty (30) Days after receipt of such satisfactory payment application, the **Engineer** will prepare and certify, and the **Commissioner** will approve, a voucher for a partial payment in the amount of such approved estimate, less any and all deductions authorized to be made by the **Commissioner** under the terms of this **Contract** or by **Law**.

#### **ARTICLE 43. PROMPT PAYMENT**

43.1 The Prompt Payment provisions of the PPB Rules in effect at the time of the Bid will be applicable to payments made under this **Contract**. The provisions require the payment to **Contractor** of interest on payments made after the required payment date, except as set forth in the PPB Rules.

43.2 The **Contractor** shall submit a proper invoice to receive payment, except where the **Contract** provides that the **Contractor** will be paid at predetermined intervals without having to submit an invoice for each scheduled payment.

43.3 Determination of interest due will be made in accordance with the PPB Rules.

43.4 If the **Contractor** is paid interest, the proportionate share of that interest shall be forwarded by the **Contractor** to its **Subcontractor(s)**.

43.5 The **Contractor** shall pay each **Subcontractor** or **Materialman** not later than seven (7) Days after receipt of payment out of amounts paid to the **Contractor** by the **City** for **Work** performed by the **Subcontractor** or **Materialman** under this **Contract**.

43.5.1 If **Contractor** fails to make any payment to any **Subcontractor** or **Materialman** within seven (7) days after receipt of payment by the **City** pursuant to section 43.5 herein, then the **Contractor** shall pay interest on amounts due to such **Subcontractor** or **Materialman** at a rate of interest in effect on the date such payment is made by the **Contractor** computed in accordance with section 756-b (1)(b) of the NY General Business Law. Accrual of interest shall commence on the day immediately following the expiration of the seventh day following receipt of payment to the **Contractor** by the **City** and shall end on the date on which payment is made.

43.6 The **Contractor** shall include in each of its subcontracts a provision requiring each **Subcontractor** to make payment to each of its **Subcontractors** or suppliers for **Work** performed under this **Contract** in the same manner and within the same time period set forth above.

#### **ARTICLE 44. SUBSTANTIAL COMPLETION PAYMENT**

44.1 When the **Work** in the opinion of the **Commissioner**, has been substantially but not entirely completed, he/she shall issue a certificate of **Substantial Completion**.

44.2 The **Contractor** shall submit with the **Substantial Completion** requisition:

44.2.1 A Final Verified Statement of any and all alleged claims against the **City** and any pending dispute resolution procedures in accord with the PPB Rules and this **Contract**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the **Contractor** claims the performance of the **Work** or a particular

part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay.

44.2.1(a) With respect to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the Corporation Counsel of the City shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this article is intended to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor** upon acceptance of the **Substantial Completion** payment pursuant to this article, will have waived any such claims.

**44.2.2 A Final Approved Punch List.**

44.2.3 Where required, a request for a substantial or final extension of time.

44.3 The **Commissioner** shall issue a voucher calling for payment of any part or all of the balance due for **Work** performed under the **Contract**, including monies retained under Article 21, less any and all deductions authorized to be made by the **Commissioner**, under this **Contract** or by **Law**, and less twice the amount the **Commissioner** considers necessary to ensure the completion of the balance of the **Work** by the **Contractor**. Such a payment shall be considered a Partial and not a Final Payment. No **Substantial Completion** payment shall be made under this article where the **Contractor** shall fail to complete the **Work** within the time fixed for such completion in the Schedule A of the General Conditions, or within the time to which completion may have been extended, until an extension or extensions of time for the completion of **Work** have been acted upon pursuant to Article 13.

44.4 No further partial payments shall be made to the **Contractor** after the **Commissioner** issues a Certificate of **Substantial Completion**, except the **Substantial Completion** payment and **Contractor's** requisition that were properly filed with the **Commissioner** prior to the date of **Substantial Completion**; however, the **Commissioner** may grant a waiver for further partial payments after the date of **Substantial Completion** to permit payments for change order **Work** and/or release of retainage and deposits pursuant to Articles 21 and 24. Such waiver shall be in writing.

44.5 The **Contractor** acknowledges that nothing contained in this article is intended to or shall in any way diminish the force and effect of Article 13.

#### **ARTICLE 45. FINAL PAYMENT**

45.1 After completion and **Final Acceptance** of the **Work**, the **Contractor** shall submit all required certificates and documents, together with a requisition for the balance claimed to be due under the **Contract**, less the amount authorized to be retained for maintenance under Article 24. A verified statement similar to that required in connection with applications for partial payments shall also be submitted to the **Commissioner**.

45.2 Amended Verified Statement of Claims: The **Contractor** shall also submit with the final requisition any amendments to the final verified statement of any and all alleged claims against the City, and any pending dispute resolution procedures in accord with the PPB Rules and this **Contract**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30.) that have occurred subsequent to **Substantial Completion**, setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each such item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the **Contractor** claims the performance of the **Work** or a particular part thereof was

delayed, and an itemized statement and breakdown of the amount claimed for each such delay. With reference to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the Corporation Counsel of the **City** shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this article, is entitled to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor**, upon acceptance of the Final Payment pursuant to Article 46, will have waived any such claims.

45.3 Preparation of Final Voucher: Upon determining the balance due hereunder other than on account of claims, the **Engineer** will prepare and certify, for the **Commissioner's** approval, a voucher for final payment in that amount less any and all deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**. In the case of a lump sum **Contract**, the **Commissioner** shall certify the voucher for final payment within thirty (30) Days from the date of completion and acceptance of the **Work**, provided all requests for extensions of time have been acted upon.

45.3.1 All prior certificates and vouchers upon which partial payments were made, being merely estimates made to enable the **Contractor** to prosecute the **Work** more advantageously, shall be subject to correction in the final voucher, and the certification of the **Engineer** thereon and the approval of the **Commissioner** thereof, shall be conditions precedent to the right of the **Contractor** to receive any money hereunder. Such final voucher shall be binding and conclusive upon the **Contractor**.

45.3.2 Payment pursuant to such final voucher, less any deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**, shall constitute the final payment, and shall be made by the **Comptroller** within thirty (30) Days after the filing of such voucher in his/her office.

45.4 The **Contractor** acknowledges that nothing contained in this article is intended to or shall in any way diminish the force and effect of Article 13.

#### **ARTICLE 46. ACCEPTANCE OF FINAL PAYMENT**

46.1 The acceptance by the **Contractor**, or by anyone claiming by or through it, of the final payment, whether such payment be made pursuant to any judgment of any Court, or otherwise, shall constitute and operate as a release to the **City** from any and all claims of and liability to the **Contractor** for anything heretofore done or furnished for the **Contractor** relating to or arising out of this **Contract** and the **Work** done hereunder, and for any prior act, neglect or default on the part of the **City** or any of its officers, agents or employees, excepting only a claim against the **City** for the amounts deducted or retained in accordance with the terms and provisions of this **Contract** or by **Law**, and excepting any claims, not otherwise waived, or any pending dispute resolution procedures which are contained in the verified statement filed with the **Contractor's** substantial and final requisitions pursuant to Articles 44 and 45.

46.2 The **Contractor** is warned that the execution by it of a release, in connection with the acceptance of the final payment, containing language purporting to reserve claims other than those herein specifically excepted from the operation of this article, or those for amounts deducted by the **Commissioner** from the final requisition or by the **Comptroller** from the final payment as certified by the **Engineer** and approved by the **Commissioner**, shall not be effective to reserve such claims, anything stated to the **Contractor** orally or in writing by any officer, agent or employee of the **City** to the contrary notwithstanding.

46.3 Should the **Contractor** refuse to accept the final payment as tendered by the **Comptroller**, it shall constitute a waiver of any right to interest thereon.

46.4 The Contractor, however, shall not be barred from commencing an action for breach of Contract under this provision to the extent permitted by Law and by the terms of the Contract provided that a detailed and verified statement of claim is served upon the contracting Agency and Comptroller not later than forty (40) Days after the mailing of such final payment. The statement shall specify the items upon which the claim will be based and any such claim shall be limited to such items.

#### **ARTICLE 47. APPROVAL BY PUBLIC DESIGN COMMISSION**

47.1 All works of art, including paintings, mural decorations, stained glass, statues, bas-reliefs and other sculptures, monuments, fountains, arches, and other structures of a permanent character intended for ornament or commemoration, and every design of the same to be used in the performance of this Contract, and the design of all bridges, approaches, buildings, gates, fences, lamps, or structures to be erected, pursuant to the terms of this Contract, shall be submitted to the Art Commission, d/b/a the Public Design Commission of the City of New York, and shall be approved by the Public Design Commission prior to the erection or placing in the position of the same. The final payment shall not become due or payable under this Contract unless and until the Public Design Commission shall certify that the design for the Work herein contracted for has been approved by the said Public Design Commission, and that the same has been executed in substantial accordance with the design so approved, pursuant to the provisions of Chapter 37, Section 854 of the City Charter, as amended.

### **CHAPTER X CONTRACTOR'S DEFAULT**

#### **ARTICLE 48. COMMISSIONER'S RIGHT TO DECLARE CONTRACTOR IN DEFAULT**

48.1 In addition to those instances specifically referred to in other Articles herein, the Commissioner shall have the right to declare the Contractor in default of this Contract if:

48.1.1 The Contractor fails to commence Work when notified to do so by the Commissioner; or if

48.1.2 The Contractor shall abandon the Work; or if

48.1.3 The Contractor shall refuse to proceed with the Work when and as directed by the Commissioner; or if

48.1.4 The Contractor shall, without just cause, reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the Commissioner, to complete the Work in accordance with the Progress Schedule; or if

48.1.5 The Contractor shall fail or refuse to increase sufficiently such working force when ordered to do so by the Commissioner; or if

48.1.6 The Contractor shall sublet, assign, transfer, convert or otherwise dispose of this Contract other than as herein specified; or sell or assign a majority interest in the Contractor; or if

48.1.7 The Contractor fails to secure and maintain all required insurance; or if

48.1.8 A receiver or receivers are appointed to take charge of the Contractor's property or affairs; or if

48.1.9 The **Commissioner** shall be of the opinion that the **Contractor** is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the **Work**, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if

48.1.10 The **Commissioner** shall be of the opinion that the **Contractor** is or has been willfully or in bad faith violating any of the provisions of this **Contract**; or if

48.1.11 The **Commissioner** shall be of the opinion that the **Work** cannot be completed within the time herein provided therefor or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the **Commissioner's** opinion, attributable to conditions within the **Contractor's** control; or if

48.1.12 The **Work** is not completed within the time herein provided therefor or within the time to which the **Contractor** may be entitled to have such completion extended; or if

48.1.13 Any statement or representation of the **Contractor** in the **Contract** or in any document submitted by the **Contractor** with respect to the **Work**, the **Project**, or the **Contract** (or for purposes of securing the **Contract**) was untrue or incorrect when made.

48.1.14 The **Contractor** or any of its officers, directors, partners, five (5%) percent shareholders, principals, or other persons substantially involved in its activities, commits any of the acts or omissions specified as the grounds for debarment in the **PPB Rules**.

48.2 Before the **Commissioner** shall exercise his/her right to declare the **Contractor** in default, the **Commissioner** shall give the **Contractor** an opportunity to be heard, upon not less than two (2) **Days** notice.

#### **ARTICLE 49. EXERCISE OF THE RIGHT TO DECLARE DEFAULT**

49.1 The right to declare in default for any of the grounds specified or referred to in Article 48 shall be exercised by sending the **Contractor** a notice, signed by the **Commissioner**, setting forth the ground or grounds upon which such default is declared (hereinafter referred to as a "Notice of Default").

49.2 The **Commissioner's** determination that the **Contractor** is in default shall be conclusive, final and binding on the parties and such a finding shall preclude the **Contractor** from commencing a plenary action for any damages relating to the **Contract**. If the **Contractor** protests the determination of the **Commissioner**, the **Contractor** may commence a lawsuit in a court of competent jurisdiction of the State of New York under Article 78 of the New York Civil Practice Law and Rules.

#### **ARTICLE 50. QUITTING THE SITE**

50.1 Upon receipt of such notice the **Contractor** shall immediately discontinue all further operations under this **Contract** and shall immediately quit the **Site**, leaving untouched all plant, materials, equipment, tools and supplies then on the **Site**.

#### **ARTICLE 51. COMPLETION OF THE WORK**

51.1 The **Commissioner**, after declaring the **Contractor** in default, may then have the **Work** completed by such means and in such manner, by **Contract** with or without public letting, or otherwise, as he/she may deem advisable, utilizing for such purpose such of the **Contractor's** plant, materials, equipment, tools and supplies remaining on the **Site**, and also such **Subcontractors**, as he/she may deem advisable.

51.2 After such completion, the **Commissioner** shall make a certificate stating the expense incurred in such completion, which shall include the cost of re-letting and also the total amount of liquidated damages (at the rate provided for in the **Contract**) from the date when the **Work** should have been completed by the **Contractor** in accordance with the terms hereof to the date of actual completion of the **Work**. Such certificate shall be binding and conclusive upon the **Contractor**, its Sureties, and any person claiming under the **Contractor**, as to the amount thereof.

51.3 The expense of such completion, including any and all related and incidental costs, as so certified by the **Commissioner**, and any liquidated damages assessed against the **Contractor**, shall be charged against and deducted out of monies which are earned by the **Contractor** prior to the date of default. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

#### **ARTICLE 52. PARTIAL DEFAULT**

52.1 In case the **Commissioner** shall declare the **Contractor** in default as to a part of the **Work** only, the **Contractor** shall discontinue such part, shall continue performing the remainder of the **Work** in strict conformity with the terms of this **Contract**, and shall in no way hinder or interfere with any **Other Contractor(s)** or persons whom the **Commissioner** may engage to complete the **Work** as to which the **Contractor** was declared in default.

52.2 The provisions of this Chapter relating to declaring the **Contractor** in default as to the entire **Work** shall be equally applicable to a declaration of partial default, except that the **Commissioner** shall be entitled to utilize for completion of the part of the **Work** as to which the **Contractor** was declared in default only such plant, materials, equipment, tools and supplies as had been previously used by the **Contractor** on such part.

#### **ARTICLE 53. PERFORMANCE OF UNCOMPLETED WORK**

53.1 In completing the whole or any part of the **Work** under the provision of this Chapter X, the **Commissioner** shall have the power to depart from or change or vary the terms and provisions of this **Contract**, provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the **Commissioner's** certificate of the cost of completion referred to in Article 51, nor shall it constitute a defense to an action to recover the amount by which such certificate exceeds the amount which would have been payable to the **Contractor** hereunder but for its default.

#### **ARTICLE 54. OTHER REMEDIES**

54.1 In addition to the right to declare the **Contractor** in default pursuant to this Chapter X, the **Commissioner** shall have the absolute right, in his/her sole discretion and without a hearing, to complete or cause to complete in the same manner as described in Articles 51 and 53, any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the Final Approved Punch List. A written notice of the exercise of this right shall be sent to the **Contractor** who shall immediately quit the **Site** in accordance with the provisions of Article 50.

54.2 The previous provisions of this Chapter X shall be in addition to any and all other legal or equitable remedies permissible in the premises.

54.3 The exercise by the **City** of any remedy set forth herein shall not be deemed a waiver by the **City** of any other legal or equitable remedy contained in this **Contract** or provided under **Law**.

54.4 The expense of such completion, including any and all related and incidental costs, as so certified by the **Commissioner**, shall be charged against and deducted out of monies which have been earned by the **Contractor** prior to the date of the exercise of the right set forth in Article 54.1; the balance of such monies, if any, subject to the other provisions of this **Contract**, to be paid to the **Contractor** without interest after such completion. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

## **CHAPTER XI MISCELLANEOUS PROVISIONS**

### **ARTICLE 55. CONTRACTOR'S WARRANTIES**

55.1 In consideration of, and to induce, the award of this **Contract** to the **Contractor**, the **Contractor** represents and warrants:

55.1.1 That it is financially solvent, sufficiently experienced and competent to perform the **Work**; and

55.1.2 That the facts stated in its bid and the information given by it pursuant to the Information for Bidders is true and correct in all respects; and

55.1.3 That it has read and complied with all requirements set forth in the **Contract**.

### **ARTICLE 56. CLAIMS AND ACTIONS THEREON**

56.1 Any claim, that is not subject to dispute resolution under the **PPB Rules** or this **Contract**, against the **City** for damages for breach of **Contract** shall not be made or asserted in any lawsuit, unless the **Contractor** shall have strictly complied with all requirements relating to the giving of notice and of information with respect to such claims, as herein before provided.

56.2 Nor shall any lawsuit be instituted or maintained on any such claims unless such lawsuit is commenced within six (6) months after the date the **Commissioner** issues a Certificate of **Substantial Completion** pursuant to Article 44; except that:

56.2.1 Any claims arising out of events occurring after the date the **Commissioner** issues a Certificate of **Substantial Completion** and before **Final Acceptance** of the **Work** shall be asserted within six (6) months of **Final Acceptance** of the **Work**;

56.2.2 Any claims for monies deducted, retained or withheld under the provisions of this **Contract** shall be asserted within six (6) months after the date when such monies becomes due and payable hereunder; and

56.2.3 If the **Commissioner** exercises his/her right to terminate the **Contract** pursuant to Article 64, any such lawsuit shall be commenced within six (6) months of the date the **Commissioner** exercises said right.

## **ARTICLE 57. INFRINGEMENT**

57.1 The **Contractor** shall be solely responsible for and shall indemnify the **City** against any and all claims and judgments for damages for any infringement of copyright and patents or use of patented articles, tools, materials, equipment, appliances or processes in the performance or completion of the **Work**, including all costs and expenses which the **City** shall or may incur or be obligated to pay by reason thereof.

## **ARTICLE 58. NO CLAIM AGAINST OFFICERS, AGENTS OR EMPLOYEES**

58.1 No claim whatsoever shall be made by the **Contractor** against any officer, agent or employee of the **City** for, or on account of, anything done or omitted to be done in connection with this **Contract**.

## **ARTICLE 59. SERVICES OF NOTICES**

59.1 The **Contractor** hereby designates the business address specified in its bid, as the place where all notices, directions or other communications to the **Contractor** may be delivered, or to which they may be mailed. Actual delivery of any such notice, direction or communication to the aforesaid place, or depositing it in a postpaid wrapper addressed thereto in any post office box (P.O. Box) regularly maintained by the United States Postal Service, shall be conclusively deemed to be sufficient service thereof upon the **Contractor** as the date of such delivery or deposit.

59.2 Such address may be changed at any time by an instrument in writing, executed and acknowledged by the **Contractor**, and delivered to the **Commissioner**.

59.3 Nothing herein contained shall, however, be deemed to preclude or render inoperative the service of any notice, direction or other communication upon the **Contractor** personally, or, if the **Contractor** is a corporation, upon any officer thereof.

## **ARTICLE 60. UNLAWFUL PROVISIONS DEEMED STRICKEN FROM CONTRACT**

60.1 If this **Contract** contains any unlawful provision not an essential part of the **Contract** and which shall not appear to have been a controlling or material inducement to the making thereof, the same shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the **Contract** without affecting the binding force of the remainder.

## **ARTICLE 61. ALL LEGAL PROVISIONS DEEMED INCLUDED**

61.1 It is the intent and understanding of the parties to this **Contract** that each and every provision of Law required to be inserted in this **Contract** shall be and is inserted herein. Furthermore, it is hereby stipulated that every such provision is to be deemed to be inserted herein, and if, through mistake or otherwise, any such provision is not inserted, or is not inserted in correct form, then this **Contract** shall forthwith upon the application of either party be amended by such insertion so as to comply strictly with the Law and without prejudice to the rights of either party hereunder.

## **ARTICLE 62. TAX EXEMPTION**

62.1 The **City** is exempt from payment of Federal, State, local taxes and Sales and Compensation Use Taxes of the State of New York and of cities and counties on all materials and supplies sold to the **City** pursuant to



the provisions of this **Contract**. These taxes are not to be included in bids. However, this exemption does not apply to tools, machinery, equipment or other property leased by or to the **Contractor** or a **Subcontractor**, or to supplies and materials which even though they are consumed, are not incorporated into the completed **Work** (consumable supplies), and the **Contractor** and its **Subcontractors** shall be responsible for and pay any and all applicable taxes, including Sales and Compensation Use Taxes, on such leased tools, machinery, equipment or other property and upon all such unincorporated supplies and materials.

62.2 The **Contractor** agrees to sell and the **City** agrees to purchase all supplies and materials, other than consumable supplies, required, necessary or proper for or incidental to the construction of the **Project** covered by this **Contract**. The sum paid under this **Contract** for such supplies and materials shall be in full payment and consideration for the sale of such supplies and materials herein.

62.2.1 The **Contractor** agrees to construct the **Project** and to perform all **Work**, labor and services rendered, necessary, proper or incidental thereto for the sum shown in the bid for the performance of such **Work**, labor and services, and the sum so paid pursuant to this **Contract** for such **Work**, labor, etc., shall be in full consideration for the performance by the **Contractor** of all its duties and obligations under this **Contract** in connection with said **Work** and labor.

62.3 The purchase by the **Contractor** of the supplies and materials sold hereunder shall be a purchase or procurement for resale and therefore not subject to the New York State or **City** Sales or Compensation Use Taxes or any such taxes of cities or counties. The sale of such supplies and materials by the **Contractor** to the **City** is exempt from the aforesaid sales or compensating use taxes. With respect to such supplies and materials, the **Contractor**, at the request of the **City**, shall furnish to the **City** such Bills of Sale and other instruments as may be required by the **City**, properly executed, acknowledged and delivered assuring to the **City** title to such supplies and materials, free of liens and/or encumbrances, and the **Contractor** shall mark or otherwise identify all such materials as the property of the **City**.

62.4 Title to all materials to be sold by the **Contractor** to the **City** pursuant to the provisions of the **Contract** shall immediately vest in and become the sole property of the **City** upon delivery of such supplies and materials to the **Site** and prior to its becoming a part of the permanent structure and/or construction. Notwithstanding such transfer of title, the **Contractor** shall have the full and continuing responsibility to install such materials and supplies in accordance with the provisions of this **Contract**, protect them, maintain them in a proper condition and forthwith repair, replace and make good any damage thereto, theft or disappearance thereof, and furnish additional materials in place of any that may be lost, stolen or rendered unusable, without cost to the **City**, until such time as the **Work** covered by the **Contract** is fully accepted by the **City**. Such transfer of title shall in no way affect any of the **Contractor's** obligations hereunder. In the event that, after title has passed to the **City**, any of such supplies and materials are rejected as being defective or otherwise unsatisfactory, title to all such supplies and materials shall be deemed to have been transferred back to the **Contractor**.

62.5 The purchase by **Subcontractors** of supplies and materials to be sold hereunder shall also be a purchase or procurement for resale to the **Contractor** (either directly or through other **Subcontractors**) and therefore not subject to the aforesaid Sales or Compensation Use Taxes, provided that the subcontract agreements provide for the resale of such supplies and materials prior to and separate and apart from the incorporation of such supplies and materials into the permanent structure and/or construction and that such subcontract agreements are in a form similar to this **Contract** with respect to the separation of the sale of materials from the **Work** and labor, services, consumable supplies and any other matters to be provided, and provided further that the subcontract agreements provide separate prices for materials and all other services and matters. Such separation shall actually be followed in practice, including the separation of payments for supplies and materials from the payments for other **Work** and labor and other things to be provided.

62.6 The **Contractor** and its **Subcontractors** and Materialmen shall obtain any and all necessary **Contractor** Exempt Purchase Certificates or Resale Certificates from the appropriate governmental **Agency** or

Agencies, and furnish a **Contractor Exempt Purchase Certificate** or **Resale Certificate** to all persons, firms or corporations from which they purchase supplies and materials for the performance of the **Work** covered by this **Contract**.

62.7 In the event any of the provisions of this article shall be deemed to be in conflict with any other provisions of this **Contract** or create any ambiguity, then the provisions of this article shall control.

### **ARTICLE 63. INVESTIGATION(S) CLAUSE**

63.1 The parties to this **Contract** agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by a United States, a State of New York (State) or a City governmental **Agency** or authority that is empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath, or conducted by the Inspector General of a governmental **Agency** that is a party in interest to the transaction, submitted bid, submitted proposal, **Contract**, lease, permit or license that is the subject of the investigation, audit or inquiry.

63.2 If any person who has been advised that his/her statement, and any information from such statement, will not be used against him/her in any subsequent criminal proceeding refuses to testify before a grand jury or other governmental **Agency** or authority empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath concerning the award of or performance under any transaction, agreement, lease, permit, **Contract**, or license entered into with the City, the State, or any political subdivision or public authority thereof, or the Port Authority of New York and New Jersey, or any local development corporation within the City, or any public benefit corporation organized under the **Laws** of the State of New York, or;

63.3 If any person refuses to testify for a reason other than the assertion of his/her privilege against self incrimination in an investigation, audit or inquiry conducted by a City or State governmental **Agency** or authority empowered directly or by designation to compel the attendance of witnesses and to take testimony under oath, or by the Inspector General of the governmental **Agency** that is a party in interest in, and is seeking testimony concerning the award of, or performance under any transaction, agreement, lease, permit, **Contract**, or license entered into with the City, the State, or any political subdivision thereof or any local development corporation within the City, then;

63.4 The **Commissioner** whose **Agency** is a party in interest to the transaction, submitted bid, submitted proposal, **Contract**, lease, permit, or license shall convene a hearing, upon not less than five (5) days written notice to the parties involved to determine if any penalties should attach for the failure of a person to testify.

63.5 If any non-governmental party to the hearing requests an adjournment, the **Commissioner** who convened the hearing may, upon granting the adjournment, suspend any **Contract**, lease, permit, or license, pending the final determination pursuant to Article 63.7 without the City incurring any penalty or damages for delay or otherwise.

63.6 The penalties which may attach after a final determination by the **Commissioner** may include but shall not exceed:

63.6.1 The disqualification for a period not to exceed five (5) years from the date of an adverse determination for any person, or any entity of which such person was a member at the time the testimony was sought, from submitting bids for, or transacting business with, or entering into or obtaining any **Contract**, lease, permit or license with or from the City; and/or

63.6.2 The cancellation or termination of any and all such existing **City Contracts**, leases, permits or licenses that the refusal to testify concerns and that have not been assigned as permitted under this **Agreement**, nor the proceeds of which pledged, to an unaffiliated and unrelated institutional lender for fair value prior to the issuance of the notice scheduling the hearing, without the **City** incurring any penalty or damages on account of such cancellation or termination; monies lawfully due for goods delivered, **Work** done, rentals, or fees accrued prior to the cancellation or termination shall be paid by the **City**.

63.7 The **Commissioner** shall consider and address in reaching his/her determination and in assessing an appropriate penalty the factors in Articles 63.7.1 and 63.7.2. The **Commissioner** may also consider, if relevant and appropriate, the criteria established in Articles 63.7.3 and 63.7.4, in addition to any other information which may be relevant and appropriate:

63.7.1 The party's good faith endeavors or lack thereof to cooperate fully and faithfully with any governmental investigation or audit, including but not limited to the discipline, discharge, or disassociation of any person failing to testify, the production of accurate and complete books and records, and the forthcoming testimony of all other members, agents, assignees or fiduciaries whose testimony is sought.

63.7.2 The relationship of the person who refused to testify to any entity that is a party to the hearing, including but not limited to, whether the person whose testimony is sought has an ownership interest in the entity and/or the degree of authority and responsibility the person has within the entity.

63.7.3 The nexus of the testimony sought to the subject entity and its **Contracts**, leases, permits or licenses with the **City**.

63.7.4 The effect a penalty may have on an unaffiliated and unrelated party or entity that has a significant interest in an entity subject to penalties under Article 63.6, provided that the party or entity has given actual notice to the **Commissioner** upon the acquisition of the interest, or at the hearing called for in Article 63.4, gives notice and proves that such interest was previously acquired. Under either circumstance the party or entity shall present evidence at the hearing demonstrating the potential adverse impact a penalty will have on such person or entity.

#### 63.8 Definitions:

63.8.1 The term "license" or "permit" as used herein shall be defined as a license, permit, franchise or concession not granted as a matter of right.

63.8.2 The term "person" as used herein shall be defined as any natural person doing business alone or associated with another person or entity as a partner, director, officer, principal or employee.

63.8.3 The term "entity" as used herein shall be defined as any firm, partnership, corporation, association, joint venture, or person that receives monies, benefits, licenses, leases, or permits from or through the **City** or otherwise transacts business with the **City**.

63.8.4 The term "member" as used herein shall be defined as any person associated with another person or entity as a partner, director, officer, principal or employee.

63.9 In addition to and notwithstanding any other provision of this **Contract**, the **Commissioner** may in his/her sole discretion terminate this **Contract** upon not less than three (3) **Days** written notice in the event the

**Contractor** fails to promptly report in writing to the **Commissioner** of the Department of Investigations ("DOI") of the **City** any solicitation of money, goods, requests for future employment or other benefit or thing of value, by or on behalf of any employee of the **City** or other person, firm, corporation or entity for any purpose which may be related to the procurement or obtaining of this **Contract** by the **Contractor**, or affecting the performance of this **Contract**.

#### **ARTICLE 64. TERMINATION BY THE CITY**

64.1 In addition to termination pursuant to any other article of this **Contract**, the **Commissioner** may, at any time, terminate this **Contract** by written notice to the **Contractor**. In the event of termination, the **Contractor** shall, upon receipt of such notice, unless otherwise directed by the **Commissioner**:

64.1.1 Stop **Work** on the date specified in the notice;

64.1.2 Take such action as may be necessary for the protection and preservation of the **City's** materials and property;

64.1.3 Cancel all cancelable orders for material and equipment;

64.1.4 Assign to the **City** and deliver to the **Site** or another location designated by the **Commissioner**, any non-cancelable orders for material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract** and not incorporated in the **Work**;

64.1.5 Take no action which will increase the amounts payable by the **City** under this **Contract**.

64.2 In the event of termination by the **City** pursuant to this article, payment to the **Contractor** shall be in accordance with Articles 64.2.1, 64.2.2 or 64.2.3, to the extent that each respective article applies.

64.2.1 Lump Sum Contracts or Items: On all lump sum **Contracts**, or on lump sum items in a **Contract**, the **City** will pay the **Contractor** the sum of Articles 64.2.1(a) and 64.2.1(b), less all payments previously made pursuant to this **Contract**. On lump sum **Contracts** only, the **City** will also pay the **Contractor** an additional sum as provided in 64.2.1(c).

64.2.1(a) For **Work** completed prior to the notice of termination, the **Contractor** shall be paid a pro rata portion of the lump sum bid amount, plus approved change orders, based upon the percent completion of the **Work**, as determined by the **Commissioner**. For the purpose of determining the pro rata portion of the lump sum bid amount to which the **Contractor** is entitled, the Bid Breakdown submitted in accordance with Article 41 shall be considered, but shall not be dispositive. The **Commissioner's** determination hereunder shall be final, binding and conclusive.

64.2.1(b) For non-cancelable material and equipment, less salvage value, that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated in the **Work**, the **Contractor** shall be paid the lesser of:

64.2.1(b)(i) The direct cost, as defined in Article 64.2.4; or

64.2.1(b)(ii) The fair and reasonable value, whichever is less, of such material and equipment, plus necessary and reasonable delivery costs.

64.2.1(b)(iii) In addition, the **Contractor** shall be paid five (5%) percent of Article 64.2.1(b)(i) or Article 64.2.1(b)(ii), whichever applies.

64.2.1(c) Except as otherwise provided in Article 64.2.1(d), on all lump sum **Contracts**, the **Contractor** shall be paid the percentage indicated below applied to the difference between the total lump sum bid amount and the total of all payments made prior to the notice of termination plus all payments allowed pursuant to Articles 64.2.1(a) and 64.2.1(b):

64.2.1(c)(i) Five (5%) percent of the first five million (\$5,000,000.) dollars; and

64.2.1(c)(ii) Three (3%) percent of any amount between five million (\$5,000,000.) dollars and fifteen million (\$15,000,000.) dollars; plus

64.2.1(c)(iii) One (1%) percent of any amount over fifteen million (\$15,000,000.) dollars.

64.2.1(d) In the event the City terminates a lump sum **Contract** pursuant to this article within ninety (90) days after registration of the **Contract** with the **Comptroller**, the **Contractor** shall be paid one (1%) percent of the difference between the lump sum bid amount and the total of all payments made pursuant to this article.

64.2.2 Unit Price Contracts or Items: On all unit price **Contracts**, or on unit price items in a **Contract**, the City will pay the **Contractor** the sum of Articles 64.2.2(a) and 64.2.2(b), less all payments previously made pursuant to this **Contract**:

64.2.2(a) For all completed units, the unit price stated in the **Contract**, and

64.2.2(b) For units that have been ordered but are only partially completed, the **Contractor** will be paid:

64.2.2(b)(i) A pro rata portion of the unit price stated in the **Contract** based upon the percent completion of the unit and

64.2.2(b)(ii) For non-cancelable material and equipment, payment will be made pursuant to Article 64.2.1(b).

64.2.3 Time and Material Contracts or Items: On all **Contracts** or items in a **Contract** where time and material records are specified as the basis for payment of the **Work**, the **Contractor** shall be paid in accordance with Article 26, less all payments previously made pursuant to this **Contract**.

64.2.4 Direct Costs: Direct Costs as used in this article shall mean:

64.2.4(a) The actual purchase price of material and equipment, plus necessary and reasonable delivery costs,

64.2.4(b) The actual cost of labor involved in construction and installation at the Site, and

64.2.4(c) The actual cost of necessary bonds and insurance purchased pursuant to requirements of this **Contract** less any amounts that have been or should be refunded by the **Contractor's** sureties or insurance carriers.

64.2.4(d) Direct Cost shall not include overhead.

64.3 In no event shall any payments under this article exceed the **Contract** price for such items.

64.4 All payments pursuant to this article shall be in the nature of liquidated damages and shall be accepted by the **Contractor** in full satisfaction of all claims against the **City**.

64.5 The **City** may deduct or set off against any sums due and payable pursuant to this article, any deductions authorized by this **Contract** or by **Law** (including but not limited to liquidated damages) and any claims it may have against the **Contractor**. The **City's** exercise of the right to terminate the **Contract** pursuant to this article shall not impair or otherwise effect the **City's** right to assert any claims it may have against the **Contractor** in a plenary action.

64.6 Where the **Work** covered by the **Contract** has been substantially completed, as determined in writing by the **Commissioner**, termination of the **Work** shall be handled as an omission of **Work** pursuant to Articles 29 and 33, in which case a Change Order will be issued to reflect an appropriate reduction in the **Contract** Sum, or if the amount is determined after final payment, such amount shall be paid by the **Contractor**.

#### **ARTICLE 65. CHOICE OF LAW, CONSENT TO JURISDICTION AND VENUE**

65.1 This **Contract** shall be deemed to be executed in the **City** of New York, State of New York, regardless of the domicile of the **Contractor**, and shall be governed by and construed in accordance with the **Laws** of the State of New York and the **Laws** of the United States, where applicable.

65.2 The parties agree that any and all claims asserted against the **City** arising under this **Contract** or related thereto shall be heard and determined in the courts of the State of New York ("New York State Courts") located in the **City** and County of New York. To effect this **Contract** and intent, the **Contractor** agrees:

65.2.1 If the **City** initiates any action against the **Contractor** in Federal Court or in New York State Court, service of process may be made on the **Contractor** either in person, wherever such **Contractor** may be found, or by registered mail addressed to the **Contractor** at its address as set forth in this **Contract**, or to such other address as the **Contractor** may provide to the **City** in writing; and

65.2.2 With respect to any action between the **City** and the **Contractor** in New York State Court, the **Contractor** hereby expressly waives and relinquishes any rights it might otherwise have:

65.2.2(a) To move to dismiss on grounds of forum non conveniens;

65.2.2(b) To remove to Federal Court; and

65.2.2(c) To move for a change of venue to a New York State Court outside New York County.

65.2.3 With respect to any action brought by the **City** against the **Contractor** in Federal Court located in the **City**, the **Contractor** expressly waives and relinquishes any right it might otherwise have to move to transfer the action to a United States Court outside the **City**.

65.2.4 If the **Contractor** commences any action against the **City** in a Court located other than in the **City** and State of New York, upon request of the **City**, the **Contractor** shall either consent to a transfer of the action to a State Court of competent jurisdiction located in the **City** and State of New York or, if the Court where the action is initially brought will not or cannot transfer the action, the

**Contractor** shall consent to dismiss such action without prejudice and may thereafter reinstate the action in a State Court of competent jurisdiction in the City.

65.3 If any provision(s) of this article is held unenforceable for any reason, each and all other provision(s) shall nevertheless remain in full force and effect.

#### **ARTICLE 66. PARTICIPATION IN AN INTERNATIONAL BOYCOTT**

66.1 The **Contractor** agrees that neither the **Contractor** nor any substantially owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations of the United States Department of Commerce promulgated thereunder.

66.2 Upon the final determination by the Commerce Department or any other Agency of the United States as to, or conviction of the **Contractor** or a substantially-owned affiliated company thereof, participation in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder, the **Comptroller** may, at his/her option, render forfeit and void this **Contract**.

66.3 The **Contractor** shall comply in all respects, with the provisions of Section 6-114 of the Administrative Code and the rules and regulations issued by the **Comptroller** thereunder.

#### **ARTICLE 67. LOCALLY BASED ENTERPRISE PROGRAM**

67.1 This **Contract** is subject to the requirements of Section 6-108.1 of the Administrative Code and regulations promulgated thereunder. No construction **Contract** shall be awarded unless and until these requirements have been complied with in their entirety.

67.2 Unless specifically waived by the **Commissioner** with the approval of the Division of Economic and Financial Opportunity of the Department of Business Services, if any portion of the **Contract** is subcontracted, not less than ten (10%) percent of the total dollar amount of the **Contract** shall be awarded to locally based enterprise ("LBEs"); except that where less than ten (10%) percent of the total dollar amount of the **Contract** is subcontracted, such lesser percentage shall be so awarded.

67.3 The prime **Contractor** shall not require performance and payment bonds from LBE **Subcontractors**.

67.4 If the **Contractor** has indicated prior to award that no **Work** will be subcontracted, no **Work** shall be subcontracted without the prior approval of the **Commissioner**, which shall be granted only if the **Contractor** makes a good faith effort beginning at least six (6) weeks before the **Work** is to be performed to obtain LBE **Subcontractors** to perform the **Work**.

67.5 If the **Contractor** has not identified sufficient LBE **Subcontractors** prior to award, it shall sign a letter of compliance stating that it complies with Section 6-108.1 of the Administrative Code, recognizes that achieving the LBE requirement is a condition of its **Contract**, and shall submit documentation demonstrating its good faith efforts to obtain LBEs. After award, the **Contractor** shall begin to solicit LBE's to perform subcontracted **Work** at least six (6) weeks before the date such **Work** is to be performed and shall demonstrate that a good faith effort has been made to obtain LBE's on each subcontract until it meets the required percentage.

67.6 Failure of the **Contractor** to comply with the requirements of Section 6-108.1 of the Administrative Code and the regulations promulgated thereunder shall constitute a material breach of **Contract**. Remedy for such breach of **Contract** may include the imposition of any or all of the following sanctions:

67.6.1 Reducing a **Contractor's** compensation by an amount equal to the dollar value of the percentage of the LBE subcontracting requirement not complied with;

67.6.2 Declaring the **Contractor** in default;

67.6.3 Where non-compliance is by an LBE, de-certifying and declaring the LBE ineligible to participate in the LBE program for a period of up to three (3) years.

#### **ARTICLE 68. ANTITRUST**

68.1 The **Contractor** hereby assigns, sells and transfers to the City all right, title and interest in and to any claims and causes of action arising under the antitrust Laws of New York State or of the United States relating to the particular goods or services purchased or procured by the City under this **Contract**.

#### **ARTICLE 69. MacBRIDE PRINCIPLES PROVISIONS**

##### **69.1 Notice To All Prospective Contractors:**

69.1.1 Local Law No. 34 of 1991 became effective on September 10, 1991 and added Section 6-115.1 of the Administrative Code. The local Law provides for certain restrictions on City **Contracts** to express the opposition of the people of the City to employment discrimination practices in Northern Ireland to promote freedom of work-place opportunity.

69.1.2 Pursuant to Section 6-115.1, prospective **Contractors** for **Contracts** to provide goods or services involving an expenditure of an amount greater than ten thousand (\$10,000.) dollars, or for construction involving an amount greater than fifteen thousand (\$15,000.) dollars, are asked to sign a rider in which they covenant and represent, as a material condition of their **Contract**, that any business operations in Northern Ireland conducted by the **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** will be conducted in accordance with the MacBride Principles of nondiscrimination in employment.

69.1.3 Prospective **Contractors** are not required to agree to these conditions. However, in the case of **Contracts** let by competitive sealed bidding, whenever the lowest responsible bidder has not agreed to stipulate to the conditions set forth in this notice and another bidder who has agreed to stipulate to such conditions has submitted a bid within five (5%) percent of the lowest responsible bid for a **Contract** to supply goods, services or contraction of comparable quality, the **Agency** shall refer such bids to the Mayor, the Speaker or other officials, as appropriate, who may determine, in accordance with applicable Law and rules, that it is in the best interest of the City that the **Contract** be awarded to other than the lowest responsible pursuant to Section 313(b)(2) of the City Charter.

69.1.4 In the case of **Contracts** let by other than competitive sealed bidding, if a prospective **Contractor** does not agree to these conditions, no **Agency**, elected official or the City Council shall award the **Contract** to that bidder unless the **Agency** seeking to use the goods, services or construction certifies in writing that the **Contract** is necessary for the **Agency** to perform its functions and there is no other responsible **Contractor** who will supply goods, services or construction of comparable quality at a comparable price.



69.2 In accordance with Section 6-115.1 of the Administrative Code, the **Contractor** stipulates that such **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** either:

69.2.1 Have no business operations in Northern Ireland, or

69.2.2 Shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Principles, and shall permit independent monitoring of their compliance with such principles.

69.3 For purposes of this Article, the following terms shall have the following meanings:

69.3.1 "MacBride Principles" shall mean those principles relating to nondiscrimination in employment and freedom of work-place opportunity which require employers doing business in Northern Ireland to:

69.3.1(a) increase the representation of individuals from under-represented religious groups in the workforce, including managerial, supervisory, administrative, clerical and technical jobs;

69.3.1(b) take steps to promote adequate security for the protection of employees from under-represented religious groups both at the work-place and while traveling to and from Work;

69.3.1(c) ban provocative religious or political emblems from the workplace;

69.3.1(d) publicly advertise all job openings and make special recruitment efforts to attract applicants from under-represented religious groups;

69.3.1(e) establish layoff, recall and termination procedures which do not in practice favor a particular religious group;

69.3.1(f) abolish all job reservations, apprenticeship restrictions and different employment criteria which discriminate on the basis of religion;

69.3.1(g) develop training programs that will prepare substantial numbers of current employees from under-represented religious groups for skilled jobs, including the expansion of existing programs and the creation of new programs to train, upgrade and improve the skills of workers from under-represented religious groups;

69.3.1(h) establish procedures to assess, identify and actively recruit employees from under-represented religious groups with potential for further advancement; and

69.3.1(i) appoint a senior management staff member to oversee affirmative action efforts and develop a timetable to ensure their full implementation.

69.4 The **Contractor** agrees that the covenants and representations in Article 69.2 are material conditions to this **Contract**. In the event the **Agency** receives information that the **Contractor** who made the stipulation required by this Article is in violation thereof, the **Agency** shall review such information and give the **Contractor** an opportunity to respond. If the **Agency** finds that a violation has occurred, the **Agency** shall have the right to declare the **Contractor** in default in default and/or terminate this **Contract** for cause and procure supplies, services or Work from another source in the manner the **Agency** deems proper. In the event of such termination, the

Contractor shall pay to the Agency, or the Agency in its sole discretion may withhold from any amounts otherwise payable to the Contractor, the difference between the Contract price for the uncompleted portion of this Contract and the cost to the Agency of completing performance of this Contract either itself or by engaging another Contractor or Contractors. In the case of a requirement Contract, the Contractor shall be liable for such difference in price for the entire amount of supplies required by the Agency for the uncompleted term of Contractor's Contract. In the case of a construction Contract, the Agency shall also have the right to hold the Contractor in partial or total default in accordance with the default provisions of this Contract, and/or may seek debarment or suspension of the Contractor. The rights and remedies of the Agency hereunder shall be in addition to, and not in lieu of, any rights and remedies the Agency has pursuant to this Contract or by operation of Law.

#### **ARTICLE 70. HEALTH INSURANCE COVERAGE**

70.1 If the price for which this Contract was awarded exceeds \$100,000, or if the price for which this Contract was awarded when combined with other construction or services contracts awarded the Contractor by the City in the year prior to award of this Contract exceeds \$100,000, the Contractor, following registration of the Contract, shall be required to submit responses to requests for information regarding the nature of any health insurance provided by the Contractor to its employees and their spouses and domestic partners, upon request of the Agency or other designated City agency.

#### **ARTICLE 71. PROHIBITION OF TROPICAL HARDWOODS**

71.1 Tropical hardwoods, as defined in Section 165 of the New York State Finance Law ("Finance Law"), shall not be utilized in the performance of this Contract except as expressly permitted by Section 165 of the Finance Law.

#### **ARTICLE 72. CONFLICTS OF INTEREST**

72.1 Section 2604 of the City Charter and other related provisions of the City Charter, the Administrative Code and the Penal Law are applicable under the terms of this Contract in relation to Conflicts of Interest and shall be extended to Subcontractors authorized to perform Work, labor and services pursuant to this Contract and further, it shall be the duty and responsibility of the Contractor to so inform its respective Subcontractors. Notice is hereby given that, under certain circumstances, penalties may be invoked against the donor as well as the recipient of any form of valuable gift.

#### **ARTICLE 73. MERGER CLAUSE**

73.1 The Written Contract herein, contains all the terms and conditions agreed upon by the parties hereto, and no other agreement, oral or otherwise, regarding the subject matter of this Contract shall be deemed to exist or to bind any of the parties hereto, or to vary any of the terms contained herein.

#### **ARTICLE 74. STATEMENT OF WORK**

74.1 The Contractor shall furnish all labor and materials and perform all Work in strict accordance with the Specifications and Addenda thereto, numbered 4.

## ARTICLE 75. COMPENSATION TO BE PAID TO CONTRACTOR

75.1 The City will pay and the Contractor will accept in full consideration for the performance of the Contract, subject to additions and deductions as provided herein, the total sum of: *One Hundred* Dollars, (\$ *139,800,00.00* ), this said sum being the Amount at which the Contract was awarded to the Contractor at a public letting thereof, based upon the Contractor's bid for the Contract.

*Thirty Nine Million Eight Hundred Thousand and 00/100*

## ARTICLE 76. ELECTRONIC FUNDS TRANSFER

76.1 In accordance with Section 6-107.1 of the New York City Administrative Code, the Contractor agrees to accept payments under this Agreement from the City by electronic funds transfer. An electronic funds transfer is any transfer of funds, other than a transaction originated by check, draft or similar paper instrument, which is initiated through an electronic terminal, telephonic instrument or computer or magnetic tape so as to order, instruct or authorize a financial institution to debit or credit an account. Prior to the first payment made under this Agreement, Contractor shall designate one financial institution or other authorized payment agent and shall complete the attached "EFT Vendor Payment Enrollment Form" in order to provide the Commissioner of Finance with information necessary for Contractor to receive electronic funds transfer payments through the designated financial institution or authorized payment agent. The crediting of the amount of a payment to the appropriate account on the books of a financial institution or other authorized payment agent designated by the Contractor shall constitute full satisfaction by the City for the amount of the payment under this agreement. The account information supplied by the Contractor to facilitate the electronic funds transfer shall remain confidential to the fullest extent provided by law.

76.2 The agency head may waive the application of the requirements herein to payments on contracts entered into pursuant to §315 of the City Charter. In addition, the Commissioner of the Department of Finance and the Comptroller may jointly issue standards pursuant to which the contracting agency may waive the requirements hereunder for payments in the following circumstances: (i) for individuals or classes of individuals for whom compliance imposes a hardship; (ii) for classifications or types of checks; or (iii) in other circumstances as may be necessary in the interest of the City.

**ARTICLE 77 – PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS  
ENTERPRISES IN CITY PROCUREMENT**

**NOTICE TO ALL PROSPECTIVE CONTRACTORS**

**ARTICLE I. M/WBE PROGRAM**

Local Law No. 129 of 2005 added Section 6-129 to the Administrative Code of the City of New York. The local law creates a program for participation by minority-owned and women-owned business enterprises (MBEs and WBEs) in City procurement. As stated in the Section 6-129, the intent of the program is to address the impact of discrimination on the City's procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. The contract provisions contained herein are made pursuant to Local Law 129, and the rules of the Department of Small Business Services ("DSBS") promulgated thereunder.

If this Contract is subject to the Minority-Owned and Women-Owned Business Enterprise ("M/WBE") program created by Local Law 129, the specific requirements of M/WBE participation for this Contract are set forth in Schedule B of the Contract (entitled the "Subcontractor Utilization Plan"), and are detailed below. The Contractor must comply with all applicable M/WBE requirements for this Contract. Schedule B of the Contract ("Subcontractor Utilization Plan") is included in the Bid Booklet.

Article I, Part A, below, sets forth provisions related to the participation goals for construction and professional services contracts. Article I, Part B, below, sets forth miscellaneous provisions related to the M/WBE program.

**PART A: PARTICIPATION GOALS FOR CONSTRUCTION  
AND PROFESSIONAL SERVICES CONTRACTS**

1. The Target Subcontracting Percentage applicable to this Contract is set forth on Schedule B, Part I to this Contract (see Page 1, line (1)). The "Target Subcontracting Percentage" is the percentage of the total Contract which Agency anticipates that the prime contractor for this Contract would in the normal course of business award to one or more subcontractors for amounts under \$1 million for construction and professional services.

A prospective contractor may seek a full or partial pre-award waiver of the Target Subcontracting Percentage in accordance with Local Law 129 and Part A, Section 10 below. To apply for the a full or partial waiver of the Target Subcontracting Percentage, a prospective contractor must complete Part III (Page 4) of Schedule B, and must submit such request no later than seven (7) days prior to the date and time the bids or proposals are due, in writing to the Agency by e-mail at [poped@ddc.nyc.gov](mailto:poped@ddc.nyc.gov) or via facsimile at (718) 391-1885. Bidders/proposers who have submitted requests will receive a response by no later than two (2) calendar days prior to the date bids or proposals are due, provided, however, that if that date would fall on a weekend or holiday, a response will be provided by close-of-business on the business day before such weekend or holiday date.

2. The Subcontractor Participation Goals established for this Contract are set forth on Schedule B, Part I to this Contract (see Page 1, line (2) and/or line (3)). The Subcontractor Participation Goals represent a percentage of the total dollar value of all construction and/or professional services subcontracts under this Agreement for amounts under \$1 million.

3. If Subcontractor Participation Goals have been established for this Contract, Contractor agrees or shall agree as a material term of the Agreement that, with respect to the total amount of the Agreement to be awarded to one or more subcontractors pursuant to subcontracts for amounts under \$1 million, Contractor shall be subject to the Subcontractor Participation Goals, unless the goals are modified by Agency in accordance with Local Law 129 and Part A, Section 11 below.

4. If Subcontractor Participation Goals have been established for this Contract, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, Part II Subcontractor Utilization Plan (see Page 2-3) indicating: (a) the percentage of work it intends to subcontract; (b) the percentage of work it intends to

award to subcontractors for amounts under \$1 million; (c) in cases where the prospective contractor intends to award subcontracts for amounts under \$1 million, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs; and (d) the general time frames in which such work by MBEs and/or WBEs is scheduled to occur. In the event that this Subcontractor Utilization Plan indicates that the bidder or proposer, as applicable, does not intend to award the **Target Subcontracting Percentage**, the bid or proposal, as applicable, shall be deemed non-responsive, unless Agency has granted the bidder or proposer, as applicable, a pre-award waiver of the **Target Subcontracting Percentage** in accordance with Local Law 129 and Part A, Section 10 below.

**THE BIDDER/PROPOSER MUST COMPLETE THE SUBCONTRACTOR UTILIZATION PLAN INCLUDED HEREIN (SCHEDULE B, PART II). SUBCONTRACTOR UTILIZATION PLANS WHICH DO NOT INCLUDE THE REQUIRED AFFIRMATIONS WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE TARGET SUBCONTRACTING PERCENTAGE IS GRANTED (SCHEDULE B PART III). IN THE EVENT THAT THE CITY DETERMINES THAT VENDOR HAS SUBMITTED A SUBCONTRACTOR UTILIZATION PLAN WHERE THE REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE PLAN ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE AFFIRMATION, THE VENDOR WILL BE NOTIFIED BY THE AGENCY AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED PLAN TO THE AGENCY. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID/PROPOSAL IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS EMAILED OR FAXED (IF THE VENDOR HAS PROVIDED AN EMAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.**

5. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor must identify all those to which it intends to award construction subcontracts for any portion of the Wicks trade work at the time of bid submission, regardless of what point in the life of the contract such subcontracts will occur. In identifying intended subcontractors in the bid submission, bidders may satisfy any Subcontractor Participation Goals established for this Contract by proposing one or more subcontractors that are M/WBEs for any portion of the Wicks trade work if the amount to be awarded to such M/WBE subcontractor is under \$1 million. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.**

6. M/WBE firms must be certified by DSBS in order for the Contractor to credit such firms' participation toward the attainment of the M/WBE participation goals. Such certification must occur prior to the firms' commencement of work as subcontractors. A list of M/WBE firms may be obtained from the DSBS website at [www.nyc.gov/buycertified](http://www.nyc.gov/buycertified), by emailing DSBS at [buyer@sbs.nyc.gov](mailto:buyer@sbs.nyc.gov), by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7<sup>th</sup> floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting [www.nyc.gov/getcertified](http://www.nyc.gov/getcertified), emailing [MWBE@sbs.nyc.gov](mailto:MWBE@sbs.nyc.gov), or calling the DSBS certification helpline at (212) 513-6311.

7. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, with each voucher for payment, and/or periodically as Agency may require, submit statements, certified under penalty of perjury, which shall include, but not be limited to, the total amount paid to subcontractors (including subcontractors that are not MBEs or WBEs); the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor pursuant to such plan as well as the dates and amounts paid to each MBE or WBE. The Contractor shall also submit, along with its voucher for final payment, the total amount paid to subcontractors (including subcontractors that are not MBEs or WBEs); and a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE hired pursuant to such plan, the work performed by, and the dates and amounts paid to each.

8. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's Subcontractor Utilization Plan, Agency shall take appropriate action, in accordance with Local Law 129 and Article II below, unless the Contractor has obtained a modification of its Subcontractor Utilization Plan in accordance with Local Law 129 and Part A, Section 11 below.

9. Where a Subcontractor Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds 10 percent of the Agreement, Agency shall establish participation goals for the work to be performed pursuant to the change order.

10. **Pre-award waiver of Target Subcontracting Percentage.** Agency may grant a full or partial waiver of the **Target Subcontracting Percentage** to a bidder or proposer, as applicable, who demonstrates—before submission of the bid or proposal—that it has legitimate business reasons for proposing the level of subcontracting in its Subcontractor Utilization Plan. In making its determination, Agency shall consider factors that shall include, but not be limited to, whether the bidder or proposer, as applicable, has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts for under one million dollars represented by the **Target Subcontracting Percentage**. In making such determination, Agency may consider whether the Subcontractor Utilization Plan is consistent with past subcontracting practices of the bidder or proposer, as applicable, and whether the bidder or proposer, as applicable, has made good faith efforts to identify portions of the Contract that it intends to subcontract.

11. **Modification of Subcontractor Utilization Plan.** A Contractor may request a modification of its Subcontractor Utilization Plan (**Subcontractor Participation Goals**) after award of this Contract. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor may request a Modification of its Subcontractor Utilization Plan as part of its bid submission.** The Agency may grant a request for Modification of a Contractor's Subcontractor Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the **Subcontractor Participation Goals**. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:

- (a) The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
- (b) The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
- (c) The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs and WBEs that their interest in the Contract was solicited;
- (d) The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the Subcontractor Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
- (e) The Contractor held meetings with MBEs and/or WBEs prior to the date their bids or proposals were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids or proposals were solicited;
- (f) The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts;
- (g) Timely written requests for assistance made by the Contractor to Agency's M/WBE liaison officer and to DSBS;
- (h) Description of how recommendations made by DSBS and Agency were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

Agency's M/WBE officer shall provide written notice to the Contractor of the determination.

12. If this Contract is for an indefinite quantity of construction or professional services or is a requirements type contract and the Contractor has submitted a Subcontractor Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the **Subcontractor Participation Goals**, the Contractor will not be deemed in violation of the M/WBE requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that the Agency has determined that such work is not needed.

13. If **Subcontractor Participation Goals** have been established for this Contract, Agency shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

## **PART B: MISCELLANEOUS**

1. The Contractor shall take notice that, if this solicitation requires the establishment of a Subcontractor Utilization Plan, the resulting contract may be audited by DSBS to determine compliance with Section 6-129. See 6-129(e)(10). Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with the Subcontractor Utilization Plan.
2. Pursuant to DSBS rules, construction contracts that include a requirement for a Subcontractor Utilization Plan shall not be subject to the law governing Locally Based Enterprises set forth in Administrative Code Section 6-108.1.
3. DSBS is available to assist contractors and potential contractors in determining the availability of MBEs and WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and WBEs in contracts.
4. Prospective contractors are encouraged to enter into joint ventures with MBEs and WBEs.
5. By submitting a bid or proposal the Contractor hereby acknowledges its understanding of the M/WBE requirements set forth herein and the pertinent provisions of Local Law 129 of 2005, and any rules promulgated thereunder, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE requirements of this Contract and pertinent provisions of Local Law 129 of 2005, and any rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of M/WBE's to meet the required **Subcontractor Participation Goals**.

## **ARTICLE II. ENFORCEMENT**

1. If Agency determines that a bidder or proposer, as applicable, has, in relation to this procurement, violated Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, Agency may disqualify such bidder or proposer, as applicable, from competing for this Contract and the Agency may revoke such bidder's or proposer's prequalification status, if applicable.
2. Whenever Agency believes that the Contractor or a subcontractor is not in compliance with Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to any Subcontractor Utilization Plan, Agency shall send a written notice to the Contractor describing the alleged noncompliance and offering an opportunity to be heard. Agency shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.
3. In the event that the Contractor has been found to have violated Section 6-129, the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements this Section 6-129, including, but not limited any Subcontractor Utilization Plan, Agency may determine that one of the following actions should be taken:
  - (a) entering into an agreement with the Contractor allowing the Contractor to cure the violation;
  - (b) revoking the Contractor's pre-qualification to bid or make proposals for future contracts;
  - (c) making a finding that the Contractor is in default of the Contract;
  - (d) terminating the Contract;
  - (e) declaring the Contractor to be in breach of Contract;
  - (f) withholding payment or reimbursement;
  - (g) determining not to renew the Contract;
  - (h) assessing actual and consequential damages;
  - (i) assess liquidated damages or reduction of fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the program established by Section 6-129, or in

meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;

- (j) exercise rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
- (k) take any other appropriate remedy.

4. If a Subcontractor Utilization Plan has been submitted, and pursuant to this Article II, Section 3, the Contractor has been found to have failed to award subcontracts to MBEs and/or WBEs sufficient to meet the Subcontractor Participation Goals contained in its Subcontractor Utilization Plan or the Subcontractor Participation Goals as modified by Agency pursuant to Article I, Part A, Section 11, Agency may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of subcontracts required to be awarded to MBE and/or WBE subcontractors to meet the Subcontractor Participation Goals and the dollar amount the Contractor actually awarded and paid to MBE and/or WBE subcontractors. In view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of Contractor's failure to meet the Subcontractor Participation Goals, the foregoing amount is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such failure, and not as a penalty. Agency may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

5. Whenever Agency has reason to believe that an MBE or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129), or has violated any provision of Section 6-129, Agency shall notify the commissioner of DSBS who shall determine whether the certification of such business enterprise should be revoked.

6. Statements made in any instrument submitted to Agency pursuant to Section 6-129 shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE or WBE in any instrument submitted pursuant to Section 6-129 shall, in addition, be grounds for revocation of its certification.

7. The Contractor's record in implementing its Subcontractor Utilization Plan shall be a factor in the evaluation of its performance. Whenever a contracting agency determines that a contractor's compliance with a Subcontractor Utilization Plan has been unsatisfactory, the agency shall, after consultation with the city chief procurement officer, file an advice of caution form for inclusion in VENDEX as caution data.



IN WITNESS WHEREOF, the <sup>Deputy</sup> Commissioner, on behalf of the City of New York, and the Contractor, have executed this agreement in quadruplicate, two parts of which are to remain with the Commissioner, another to be filed with the Comptroller of the City, and the fourth to be delivered to the Contractor.

THE CITY OF NEW YORK

By:

*[Signature]*  
Deputy Commissioner

CONTRACTOR:

*POISOMATIC DEVELOPMENT CORPORATION*

By:

*[Signature]*  
(Member of Firm or Officer of Corporation)

*DAVID A. TENEBES*

Title:

*EXECUTIVE VICE PRESIDENT*

(Where Contractor is a Corporation, add):  
Attest:

*[Signature]*  
Secretary

*DAVID A. TENEBES*

(Seal)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of New York County of Queens ss:

On this 20<sup>th</sup> day of Feb 2014, before me personally came DAVID A. Tameles  
to me known, who, being by me duly sworn did depose and say that he resides at 29 SHELWOOD PL.  
OLDUS TOWNSHIP, NAD TOWNSHIP that he is the EXECUTIVE VP PRES & SECRETARY  
of the corporation described in and which executed the foregoing instrument; that he knows the seal of said  
corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the  
directors of said corporation, and that he signed his name thereto by like order.

VICTORIA AYO-VAUGHAN  
Notary Public, State of New York  
Registration #01AY5014042  
Qualified In Queens County  
Commission Expires July 15, 2015

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, before me personally appeared \_\_\_\_\_  
to me known, and known to me to be one of the members of the firm of \_\_\_\_\_  
described in and who executed the foregoing instrument; and he  
acknowledged to me that he executed the same as and for the act and deed of said firm.

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

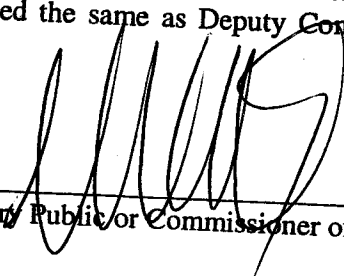
On this \_\_\_\_\_ day of \_\_\_\_\_, before me personally appeared \_\_\_\_\_  
to me known, and known to me to be the person described in and who executed the foregoing instrument; and  
acknowledged that he executed the same.

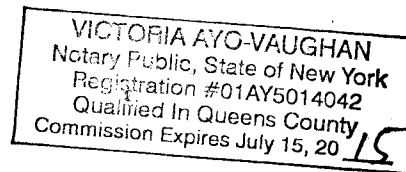
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT BY COMMISSIONER

State of New York County of Queens ss:

On this 24<sup>th</sup> day of Feb. 2014, before me personally came David Lerrick  
to me known, and known to be the Deputy Commissioner of the Department of Design and Construction of  
The City of New York, the person described as such in and who as such executed the foregoing instrument  
and he acknowledged to me that he executed the same as Deputy Commissioner for the purposes therein  
mentioned.

  
\_\_\_\_\_  
Notary Public or Commissioner of Deeds



AUTHORITY

MAYOR'S CERTIFICATE NO. CBX  
BUDGET DIRECTOR'S CERTIFICATE NO.

DATED  
DATED

APPROPRIATION  
COMMISSIONER'S CERTIFICATE

In conformity with the provisions of Section 6-101 of the Administrative Code of the City of New York, it is hereby certified that the estimated cost of the work, materials and supplies required by the within Contract, amounting to

*One Hundred Fifty-Nine Million  
Eight Hundred Thousand and 00/100*

Dollars (\$ 139,800,000.00)

is chargeable to the fund of the Department of Design and Construction entitled Code

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Department of Design and Construction

I hereby certify that the specifications contained herein comply with the terms and conditions of the BUDGET.

*[Signature]*  
\_\_\_\_\_  
Deputy Commissioner

COMPTROLLER'S CERTIFICATE

The City of New York \_\_\_\_\_

Pursuant to the provisions of Section 6-101 of the Administrative Code of the City of New York, I hereby certify that there remains unapplied and unexpended a balance of the above mentioned fund applicable to this Contract sufficient to pay the estimated expense of executing the same viz:

\$ \_\_\_\_\_

\_\_\_\_\_  
Comptroller

**MAYOR'S CERTIFICATE OR  
CERTIFICATE OF THE DIRECTOR  
OF THE BUDGET**

**Performance Bond #1 (Pages 80 to 83): Use if the total contract price is \$5 Million Or Less.**  
**Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA")**  
**for participation in its Bond Guarantee Program.**

PERFORMANCE BOND #1 (Page 1)

PERFORMANCE BOND #1

KNOW ALL PERSONS BY THESE PRESENTS, That we, \_\_\_\_\_

hereinafter referred to as the "Principal", and \_\_\_\_\_

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK,  
hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

(\$ \_\_\_\_\_) Dollars, lawful money of the United States, for the payment of which said sum of  
money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors  
and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;



# CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)  
02/24/2014

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

**IMPORTANT:** If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

<b>PRODUCER</b> Construction Risk Partners, LLC  Campus View Plaza 1250 Route 28, Suite 201 Branchburg, NJ 08876	1-908-566-1010	<b>CONTACT NAME:</b>	
		<b>PHONE (A/C, No, Ext):</b>	<b>FAX (A/C, No):</b>
		<b>E-MAIL ADDRESS:</b>	
		<b>INSURER(S) AFFORDING COVERAGE</b>	<b>NAIC #</b>
		INSURER A: TRAVELERS PROP CAS CO OF AMER	25674
		INSURER B: CHARTER OAK FIRE INS CO	25615
		INSURER C:	
		INSURER D:	
		INSURER E:	
		INSURER F:	

**COVERAGES**      **CERTIFICATE NUMBER:** 38534947      **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<b>GENERAL LIABILITY</b> <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR  <input checked="" type="checkbox"/> Contractual Liability  GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC			DT-CO-7381M747-TIL-13	10/18/13	10/18/14	EACH OCCURRENCE \$ 3,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 3,000,000 GENERAL AGGREGATE \$ 6,000,000 PRODUCTS - COMP/OP AGG \$ 6,000,000 \$
B	<b>AUTOMOBILE LIABILITY</b> <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS			DT-810-7381M747-COF-13	10/18/13	10/18/14	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
	<b>UMBRELLA LIAB</b> <input type="checkbox"/> OCCUR <b>EXCESS LIAB</b> <input type="checkbox"/> CLAIMS-MADE  DED <input type="checkbox"/> RETENTION \$						EACH OCCURRENCE \$ AGGREGATE \$ \$
A	<b>WORKERS COMPENSATION AND EMPLOYERS' LIABILITY</b> ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	DTJ-UB-7434M12A-13	10/18/13	10/18/14	<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

The City of New York, including its officials and employees, Greeley and Hansen, LLC, and URS/The LiRo Group, a Joint Venture are additional insureds with respects to the Southwest Brooklyn Marine Transfer Station-Building Construction Project.

**CERTIFICATE HOLDER****CANCELLATION**

New York City Department of Design & Construction  
Agency Chief Contracting Office  
Attn: Risk Manager, Fourth Floor  
- 30 Thomson Ave.

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Long Island City, NY 11101

USA

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STATE OF NEW YORK  
WORKERS' COMPENSATION BOARD

CERTIFICATE OF INSURANCE COVERAGE UNDER THE NYS DISABILITY BENEFITS LAW

**PART 1. To be completed by Disability Benefits Carrier or Licensed Insurance Agent of that Carrier**

1a. Legal Name and Address of Insured (Use street address only)

**PRISMATIC DEVELOPMENT CORP  
60 RT 46 EAST  
FAIRFIELD, NJ 07004**

1b. Business Telephone Number of Insured  
**973-882-1133**

1c. NYS Unemployment Insurance Employer Registration  
Number of Insured  
**6111820**

1d. Federal Employer Identification Number of Insured or  
Social Security Number  
**222433095**

2. Name and Address of the Entity Requesting Proof of  
Coverage (Entity Being Listed as the Certificate Holder)

**NEW YORK CITY DEPARTMENT OF DESIGN AND  
CONSTRUCTION  
AGENCY CHIEF CONTRACTING OFFICE  
ATTN: RISK MANAGER, 4TH FLOOR  
30-30 THOMSON AVE  
LONG ISLAND CITY, NY 11101**

3a. Name of Insurance Carrier  
**HARTFORD LIFE INSURANCE CO.**

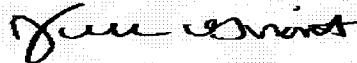
3b. Policy Number of entity listed in box "1a":  
**2P84295A5AA**

3c. Policy effective period:  
**04/01/2014 to 03/31/2015**

4. Policy covers:

- a. ☒ All of the employer's employees eligible under the New York Disability Benefits Law  
b. ☐ Only the following class or classes of the employer's employees:

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability Benefits insurance coverage as described above.



Date Signed 2/19/2014

By \_\_\_\_\_

(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number (800) 454-7020 Title Manager

**IMPORTANT:** If box "4a" is checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is **COMPLETE**. Mail it directly to the certificate holder.

If box "4b" is checked, this certificate is **NOT COMPLETE** for purposes of Section 220, Subd. 8 of the Disability Benefits Law. It must be mailed for completion to the Workers' Compensation Board, DB Plans Acceptance Unit, 20 Park Street, Albany, New York 12207.

**PART 2. To be completed by NYS Workers' Compensation Board (Only if box "4b" of Part 1 has been checked)**

**State Of New York  
Workers' Compensation Board**

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability Benefits Law with respect to all of his/her employees.

Date Signed \_\_\_\_\_

By \_\_\_\_\_

(Signature of NYS Workers' Compensation Board Employee)

Telephone Number \_\_\_\_\_

Title \_\_\_\_\_

**Please Note:** Only insurance carriers licensed to write NYS disability benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. **Insurance brokers are NOT authorized to issue this form.**



## Additional Instructions for Form DB-120.1

By signing this form, the insurance carrier identified in box "3" on this form is certifying that it is insuring the business referenced in box "1a" for disability benefits under the New York State Disability Benefits Law. The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed as the certificate holder in box "2". ***This Certificate is valid for the earlier of one year after this form is approved by the insurance carrier or its licensed agent, or the policy expiration date listed in box "3c".***

Please Note: Upon the cancellation of the disability benefits policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of NYS Disability Benefits Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Disability Benefits Law.

### DISABILITY BENEFITS LAW

#### §220. Subd. 8

- (a) The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any disability benefits to any such employee if so employed.
- (b) The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article.

STATE OF NEW YORK  
WORKERS' COMPENSATION BOARD

CERTIFICATE OF INSURANCE COVERAGE UNDER THE NYS DISABILITY BENEFITS LAW

**PART 1. To be completed by Disability Benefits Carrier or Licensed Insurance Agent of that Carrier**

1a. Legal Name and Address of Insured (Use street address only)

**PRISMATIC DEVELOPMENT CORP  
60 RT 46 EAST  
FAIRFIELD, NJ 07004**

1b. Business Telephone Number of Insured  
**973-882-1133**

1c. NYS Unemployment Insurance Employer Registration  
Number of Insured  
**6111820**

1d. Federal Employer Identification Number of Insured or  
Social Security Number  
**222433095**

2. Name and Address of the Entity Requesting Proof of  
Coverage (Entity Being Listed as the Certificate Holder)

**NEW YORK CITY DEPARTMENT OF DESIGN AND  
CONSTRUCTION  
AGENCY CHIEF CONTRACTING OFFICE  
ATTN: RISK MANAGER, 4TH FLOOR  
30-30 THOMSON AVE  
LONG ISLAND CITY, NY 11101**

3a. Name of Insurance Carrier  
**HARTFORD LIFE INSURANCE CO.**

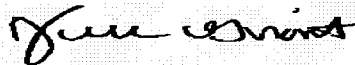
3b. Policy Number of entity listed in box "1a":  
**2P84295A5AA**

3c. Policy effective period:  
**04/01/2014 to 03/31/2015**

4. Policy covers:

- a. ☒ All of the employer's employees eligible under the New York Disability Benefits Law  
b. ☐ Only the following class or classes of the employer's employees:

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability Benefits insurance coverage as described above.



Date Signed 2/19/2014

By \_\_\_\_\_

(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number (800) 454-7020 Title Manager

**IMPORTANT:** If box "4a" is checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is **COMPLETE**. Mail it directly to the certificate holder.

If box "4b" is checked, this certificate is **NOT COMPLETE** for purposes of Section 220, Subd. 8 of the Disability Benefits Law. It must be mailed for completion to the Workers' Compensation Board, DB Plans Acceptance Unit, 20 Park Street, Albany, New York 12207.

**PART 2. To be completed by NYS Workers' Compensation Board (Only if box "4b" of Part 1 has been checked)**

**State Of New York  
Workers' Compensation Board**

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability Benefits Law with respect to all of his/her employees.

Date Signed \_\_\_\_\_

By \_\_\_\_\_

(Signature of NYS Workers' Compensation Board Employee)

Telephone Number \_\_\_\_\_

Title \_\_\_\_\_

**Please Note:** Only insurance carriers licensed to write NYS disability benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. **Insurance brokers are NOT authorized to issue this form.**

## Additional Instructions for Form DB-120.1

By signing this form, the insurance carrier identified in box "3" on this form is certifying that it is insuring the business referenced in box "1a" for disability benefits under the New York State Disability Benefits Law. The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed as the certificate holder in box "2". ***This Certificate is valid for the earlier of one year after this form is approved by the insurance carrier or its licensed agent, or the policy expiration date listed in box "3c".***

Please Note: Upon the cancellation of the disability benefits policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of NYS Disability Benefits Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Disability Benefits Law.

### DISABILITY BENEFITS LAW

#### §220. Subd. 8

- (a) The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any disability benefits to any such employee if so employed.
- (b) The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article.

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART II. Broker's Certification**

[Pursuant to Article 22.3.1(a) of the Contract, every Certificate of Insurance must be accompanied by either the following certification by the broker setting forth the following text and required information and signatures or complete copies of all policies referenced in the Certificate of Insurance. In the absence of completed policies, binders are acceptable.]

**CERTIFICATION BY BROKER**

The undersigned insurance broker represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects, and that the described insurance is effective as of the date of this Certification.

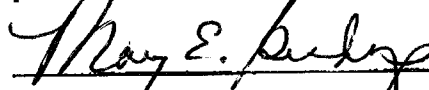
Construction Risk Partners

[Name of broker (typewritten)]

1250 Route 28, Suite 201

Branchburg, NJ 08876

[Address of broker (typewritten)]

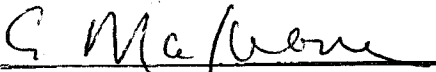


[Signature of authorized official or broker]

Mary E. Bishop - Account Executive

[Name and title of authorized official (typewritten)]

Sworn to before me this  
20th day of February, 2014



NOTARY PUBLIC

ANN MARIE KEANE  
NOTARY PUBLIC OF NEW JERSEY  
MY COMMISSION EXPIRES MAY 19, 2015



**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page 1)

PERFORMANCE BOND #2

Bond No. 08937329

KNOW ALL PERSONS BY THESE PRESENTS, That we, \_\_\_\_\_

Prismatic Development Corp.

60 Route 46

Fairfield, NJ 07004

hereinafter referred to as the "Principal", and \_\_\_\_\_

Fidelity and Deposit Company of Maryland

Zurich American Insurance Company

300 Interpace Parkway, Morris Corp. I

Parsippany, NJ 07054

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK,  
hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

One Hundred Thirty Nine Million Eight Hundred Thousand and 00/100

(\$ 139,800,000.00 ) Dollars, lawful money of the United States, for the payment of which said sum  
of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators,  
successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for  
Southwest Brooklyn Marine Transfer Station-Building

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;



**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page2)

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and/or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of failure so to do, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making good any such default, and shall protect the said City of New York against, and pay any and all amounts, damages, costs and judgments which may or shall be recovered against said City or its officers or agents of which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the doing of said work, or the repair or maintenance thereof, or the manner of doing the same, or the neglect of the said PRINCIPAL, or his (their, its) agents or servants, or the improper performance of the said work by the said PRINCIPAL, or his (their, its) agents or servants, or the infringement of any patent or patent rights by reason of the use of any materials furnished or work done as aforesaid or otherwise, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, if requested to do so by the City, to fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, if the City determines that the Principal, for any cause, has failed or neglected to fully perform and complete such Work. The Surety (Sureties) further agrees to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and to complete all Work within such time as the City may fix. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or Work to be performed thereunder, or by any payment thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.





**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

**PERFORMANCE BOND #2 (Page 3)**

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this 20th day of February, 2014.

(Seal)

Prismatic Development Corp. (L.S.)

Principal

By: Michael Vetri  
Michael Vetri, Vice President

(Seal)

Fidelity and Deposit Company of Maryland

Surety

By: A. McKeane  
AnnMarie Keane, Attorney-in-Fact

(Seal)

Zurich American Insurance Company

Surety

By: A. McKeane  
AnnMarie Keane, Attorney-in-Fact

(Seal)

Surety

By: \_\_\_\_\_

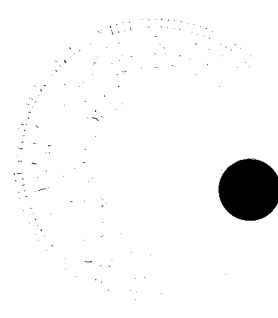
Bond Premium Rate \$7.50 / thousand

Bond Premium Cost \$1,174,320.00

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.



**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page 4)

**ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION**

State of NJ County of Essex ss:

On this 20th day of February, 2014 before me personally came Michael Vetri to me known, who, being by me duly sworn did depose and say that he resides at 16 Kristin Court Towaco, NJ 07082 that he is the Vice President of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

Karen A. Meyer  
Notary Public or Commissioner of Deeds

KAREN A. MEYER  
NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

**ACKNOWLEDGMENT OF PRINCIPAL IF A PARTNERSHIP**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be one of the members of the firm of \_\_\_\_\_ described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL IF AN INDIVIDUAL**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

\* \* \* \* \*

Affix Acknowledgments and Justification of Sureties.

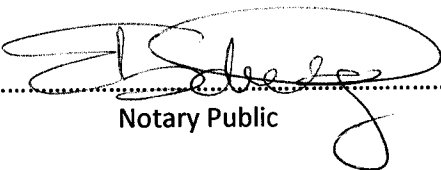


**ACKNOWLEDGMENT OF SURETY COMPANY**

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **20th** day of **February 2014**, before me personally came **AnnMarie Keane**, to me known, who, being by me duly sworn, did depose and say; that he is the Attorney-in-Fact of the **Fidelity and Deposit Company of Maryland** the corporation described in which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he signed his name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he signed said Instrument as an Attorney-in-Fact of said company by like authority.

  
.....  
Notary Public

**ELIZABETH RIGA**  
**NOTARY PUBLIC OF NEW JERSEY**  
**My Commission Expires on March 13, 2018**



# FIDELITY AND DEPOSIT COMPANY

OF MARYLAND

600 Red Brook Blvd., Suite 600, Owings Mills, MD 21117

## Statement of Financial Condition

As Of December 31, 2012

### ASSETS

Bonds .....	\$ 157,177,826
Stocks .....	23,000,311
Cash and Short Term Investments.....	119,155
Reinsurance Recoverable .....	17,923,564
Other Accounts Receivable.....	35,473,256
TOTAL ADMITTED ASSETS .....	<u>\$ 233,694,113</u>

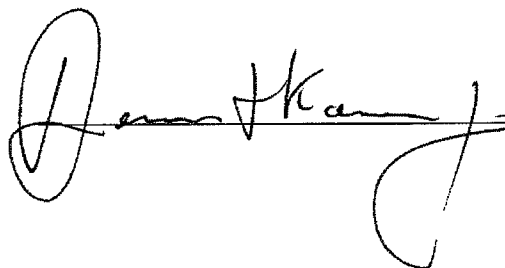
### LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses .....	\$ 74,782
Ceded Reinsurance Premiums Payable .....	48,323,524
Securities Lending Collateral Liability .....	1,716,240
TOTAL LIABILITIES .....	<u>\$ 50,114,546</u>
Capital Stock, Paid Up .....	\$ 5,000,000
Surplus .....	<u>178,579,567</u>
Surplus as regards Policyholders.....	183,579,567
TOTAL .....	<u>\$ 233,694,113</u>

Securities carried at \$59,468,002 in the above statement are deposited as required by law.

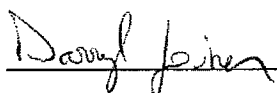
Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of December 31, 2012 market quotations for all bonds and stocks owned, the Company's total admitted assets would be \$243,518,971 and surplus as regards policyholders \$193,404,425.

I, DENNIS F. KERRIGAN, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2012.

  
Corporate Secretary

State of Illinois }  
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2013.

  
Notary Public



February 20, 2014





**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND  
POWER OF ATTORNEY**

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **THOMAS O. MCCLELLAN, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, Frederick E. NICHOLSON, Robert S. RAPP JR., Joseph T. CHARCZENKO, AnnMarie KEANE and Elizabeth RIGA**, all of Branchburg, New Jersey, **EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 4th day of February, A.D. 2013.

**ATTEST:**

**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**



*Gregory E. Murray*

By: \_\_\_\_\_  
Assistant Secretary  
Gregory E. Murray

*Thomas O. McClellan*

\_\_\_\_\_  
Vice President  
Thomas O. McClellan

State of Maryland  
City of Baltimore

On this 4th day of February, A.D. 2013, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **THOMAS O. MCCLELLAN, Vice President, and GREGORY E. MURRAY, Assistant Secretary**, of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, depose and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

*Constance A. Dunn*

\_\_\_\_\_  
Constance A. Dunn, Notary Public  
My Commission Expires: July 14, 2015



## EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify or revoke any such appointment or authority at any time."

### CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 20th day of February, 2014.



*Geoffrey Delisio*

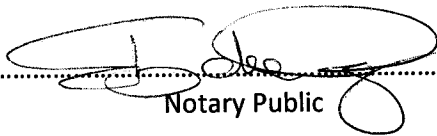
Geoffrey Delisio, Vice President

**ACKNOWLEDGMENT OF SURETY COMPANY**

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **20th** day of **February 2014**, before me personally came **AnnMarie Keane**, to me known, who, being by me duly sworn, did depose and say; that he is the Attorney-in-Fact of the **Zurich American Insurance Company** the corporation described in which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he signed his name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he signed said Instrument as an Attorney-in-Fact of said company by like authority.

  
.....  
Notary Public

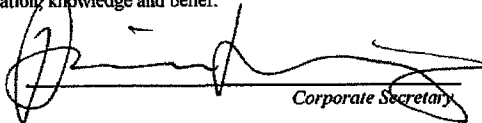
**ELIZABETH RIGA**  
**NOTARY PUBLIC OF NEW JERSEY**  
**My Commission Expires on March 13, 2018**



**ZURICH AMERICAN INSURANCE COMPANY**  
**COMPARATIVE BALANCE SHEET**  
**ONE LIBERTY PLAZA, 165 BROADWAY, 32nd FLOOR, NEW YORK, NY 10006**  
**As of December 31, 2012 and December 31, 2011**

	12/31/2012	12/31/2011
<b>Assets</b>		
Bonds	\$ 18,907,466,866	\$ 18,985,096,131
Preferred Stock	-	259,036
Common Stock	2,123,025,432	2,068,881,919
Other Invested Assets	2,035,077,824	2,065,634,039
Short-term Investments	126,053,209	107,298,374
Receivable for securities	134,410,839	18,523,294
Cash and cash equivalents	728,298,115	(128,716,627)
Securities lending reinvested collateral assets	225,335,750	120,821,061
Employee Trust for Deferred Compensation Plan	130,493,778	124,809,033
Total Cash and Invested Assets	<u>\$ 24,410,161,814</u>	<u>\$ 23,362,606,260</u>
 Premiums Receivable	 \$ 3,649,247,239	 \$ 3,611,868,304
Funds Held with Reinsurers	3,681,443	28,073,922
Reinsurance Recoverable	215,451,507	233,357,918
Accrued Investment Income	121,729,727	149,372,442
Federal Income Tax Recoverable	930,267,731	788,664,462
Due from Affiliates	187,274,289	95,583,016
Other Assets	493,265,075	459,639,011
Total Assets	<u>\$ 30,011,078,824</u>	<u>\$ 28,729,165,335</u>
 <b>Liabilities and Policyholders' Surplus</b>		
<b>Liabilities:</b>		
Loss and LAE Reserves	\$ 14,244,436,264	\$ 14,401,632,170
Unearned Premium Reserve	4,159,670,241	4,066,273,586
Funds Held with Reinsurers	212,412,675	218,214,563
Loss In Course of Payment	408,170,112	353,274,509
Commission Reserve	64,038,359	63,749,920
Federal Income Tax Payable	16,190,044	47,352,138
Remittances and Items Unallocated	196,410,982	69,677,903
Payable to parent, subs and affiliates	57,540,814	92,111,683
Provision for Reinsurance	66,649,220	60,498,188
Ceded Reinsurance Premiums Payable	551,510,878	278,235,370
Securities Lending Collateral Liability	225,335,750	120,821,061
Other Liabilities	2,166,453,164	1,938,544,837
Total Liabilities	<u>\$ 22,368,818,502</u>	<u>\$ 21,710,385,928</u>
 <b>Policyholders' Surplus:</b>		
Common Capital Stock	\$ 5,000,000	\$ 5,000,000
Paid-In and Contributed Surplus	4,394,131,321	4,394,131,320
Surplus Notes	430,000,000	883,000,000
Special Surplus Funds	43,259,000	396,438,437
Cumulative Unrealized Gain	331,857,594	209,454,958
Unassigned Surplus	2,438,012,408	1,130,754,692
Total Policyholders' Surplus	<u>\$ 7,642,260,323</u>	<u>\$ 7,018,779,407</u>
 Total Liabilities and Policyholders' Surplus	<u>\$ 30,011,078,824</u>	<u>\$ 28,729,165,335</u>

I, Dennis F. Kerrigan, Corporate Secretary of ZURICH AMERICAN INSURANCE COMPANY do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company, on the 31st day of December, 2012, according to the best of my information, knowledge and belief.

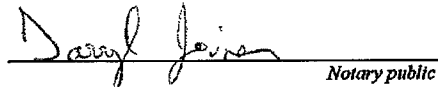
  
Corporate Secretary

State of Illinois  
County of Cook

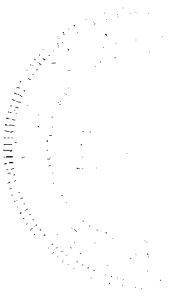
} SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2013.



  
Notary public

February 20, 2014



**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND  
POWER OF ATTORNEY**

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **THOMAS O. MCCLELLAN, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, Frederick E. NICHOLSON, Robert S. RAPP JR., Joseph T. CHARCZENKO, AnnMarie KEANE and Elizabeth RIGA, all of Branchburg, New Jersey, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 4th day of February, A.D. 2013.

**ATTEST:**

**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**



*Gregory E. Murray*

By: \_\_\_\_\_

*Assistant Secretary  
Gregory E. Murray*

*Thomas O. McClellan*

*Vice President  
Thomas O. McClellan*

**State of Maryland  
City of Baltimore**

On this 4th day of February, A.D. 2013, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **THOMAS O. MCCLELLAN, Vice President, and GREGORY E. MURRAY, Assistant Secretary**, of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, depose and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

*Constance A. Dunn*

*Constance A. Dunn, Notary Public  
My Commission Expires: July 14, 2015*





## EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify or revoke any such appointment or authority at any time."

### CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 20th day of February, 2014.



*Geoffrey Delisio*

Geoffrey Delisio, Vice President

**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

PAYMENT BOND (Page 1)

Bond No. 08937329

**PAYMENT BOND**

KNOW ALL PERSONS BY THESE PRESENTS, That we, \_\_\_\_\_

Prismatic Development Corp.

60 Route 46

Fairfield, NJ 07004

hereinafter referred to as the "Principal", and \_\_\_\_\_

Fidelity and Deposit Company of Maryland

Zurich American Insurance Company

300 Interpace Parkway, Morris Corp. I

Parsippany, NJ 07054

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK,  
hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

One Hundred Thirty Nine Million Eight Hundred Thousand and 00/100

(\$139,800,000.00) Dollars, lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for  
Southwest Brooklyn Marine Transfer Station-Building

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and assigns shall promptly pay or cause to be paid all lawful claims for

(a) Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto, whether such persons be agents servants or employees of the Principal or any such Subcontractor, including all persons so



**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

**PAYMENT BOND (Page 2)**

engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the Project regardless of any contractual relationship between the Principal or such Subcontractors, or his or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the project; and

(b) Materials and supplies (whether incorporated in the permanent structure or not), as well as teams, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be void, otherwise to remain in full force and effect.

This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialmen or laborer having a just claim, as well as the City itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and his, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other persons as party plaintiff.

(c) The Principal and Surety (Sureties) agree that neither of them will hold the City liable for any judgment for costs of otherwise, obtained by either or both of them against a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

(d) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

(e) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself and his successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the City to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed rendered, or furnished as aforesaid upon the ground that there is no law authorizing the City to require the foregoing provisions to be placed in this bond.

And the Surety (Sureties); for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties), and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due to become due thereunder and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done or in relation to said Principal.



**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

**PAYMENT BOND (Page 3)**

IN WITNESS HEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this 20th day of February, 2014.

(Seal)

Prismatic Development Corp. (L.S.)

Principal

By: Michael Vetri  
Michael Vetri, Vice President

(Seal)

Fidelity and Deposit Company of Maryland

Surety

By: AnnMarie Keane  
AnnMarie Keane, Attorney-in-Fact

(Seal)

Zurich American Insurance Company

Surety

By: AnnMarie Keane  
AnnMarie Keane, Attorney-in-Fact

(Seal)

Surety

By: \_\_\_\_\_

(Seal)

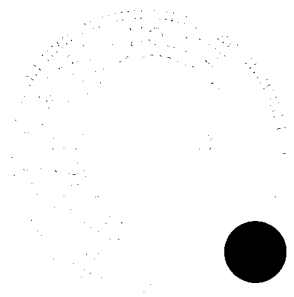
Surety

By: \_\_\_\_\_

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.



**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

PAYMENT BOND (Page 4)

**ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION**

State of NJ County of Essex ss:

On this 20th day of February, 2014 before me personally came Michael Vetri to me known, who, being by me duly sworn did depose and say that he resides at 16 Kristin Court, Towaco, NJ 07082

that he is the Vice President of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

Karen A. Meyer KAREN A. MEYER  
Notary Public or Commissioner of Deeds NOTARY PUBLIC OF NEW JERSEY  
My Commission Expires April 5, 2014

**ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be one of the members of the firm of \_\_\_\_\_

described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

\* \* \* \* \*

Affix Acknowledgments and Justification of Sureties





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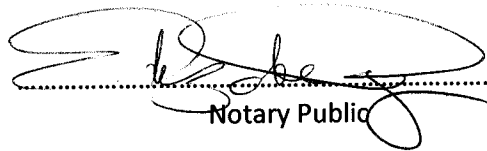


**ACKNOWLEDGMENT OF SURETY COMPANY**

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **20th** day of **February 2014**, before me personally came **AnnMarie Keane**, to me known, who, being by me duly sworn, did depose and say; that he is the Attorney-in-Fact of the **Fidelity and Deposit Company of Maryland** the corporation described in which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he signed his name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he signed said Instrument as an Attorney-in-Fact of said company by like authority.

  
Notary Public

**ELIZABETH RIGA**  
**NOTARY PUBLIC OF NEW JERSEY**  
My Commission Expires on **March 13, 2018**



# FIDELITY AND DEPOSIT COMPANY

OF MARYLAND

600 Red Brook Blvd., Suite 600, Owings Mills, MD 21117

## Statement of Financial Condition

As Of December 31, 2012

### ASSETS

Bonds .....	\$ 157,177,826
Stocks .....	23,000,311
Cash and Short Term Investments.....	119,155
Reinsurance Recoverable .....	17,923,564
Other Accounts Receivable.....	35,473,256
<b>TOTAL ADMITTED ASSETS .....</b>	<b>\$ 233,694,113</b>

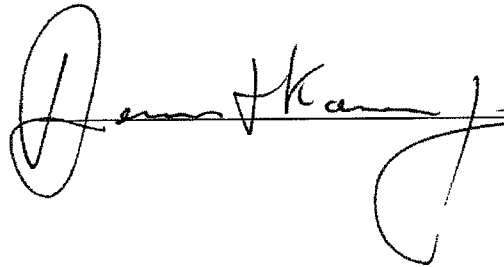
### LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses.....	\$ 74,782
Ceded Reinsurance Premiums Payable .....	48,323,524
Securities Lending Collateral Liability .....	1,716,240
<b>TOTAL LIABILITIES.....</b>	<b>\$ 50,114,546</b>
Capital Stock, Paid Up .....	\$ 5,000,000
Surplus .....	178,579,567
Surplus as regards Policyholders.....	183,579,567
<b>TOTAL .....</b>	<b>\$ 233,694,113</b>

Securities carried at \$59,468,002 in the above statement are deposited as required by law.

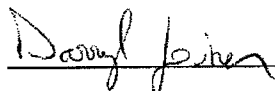
Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of December 31, 2012 market quotations for all bonds and stocks owned, the Company's total admitted assets would be \$243,518,971 and surplus as regards policyholders \$193,404,425.

I, DENNIS F. KERRIGAN, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2012.

  
Corporate Secretary

State of Illinois }  
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2013.

  
Notary Public



February 20, 2014



**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND  
POWER OF ATTORNEY**

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **THOMAS O. MCCLELLAN, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, Frederick E. NICHOLSON, Robert S. RAPP JR., Joseph T. CHARCZENKO, AnnMarie KEANE and Elizabeth RIGA, all of Branchburg, New Jersey, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 4th day of February, A.D. 2013.

**ATTEST:**

**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**



*Gregory E. Murray*

By: \_\_\_\_\_

*Assistant Secretary  
Gregory E. Murray*

*Thomas O. McClellan*

*Vice President  
Thomas O. McClellan*

State of Maryland  
City of Baltimore

On this 4th day of February, A.D. 2013, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **THOMAS O. MCCLELLAN, Vice President, and GREGORY E. MURRAY, Assistant Secretary**, of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, depose and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

*Constance A. Dunn*

Constance A. Dunn, Notary Public  
My Commission Expires: July 14, 2015





## EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify or revoke any such appointment or authority at any time."

### CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 2nd day of February, 20 14.



A handwritten signature in cursive script that reads "Geoffrey Delisio".

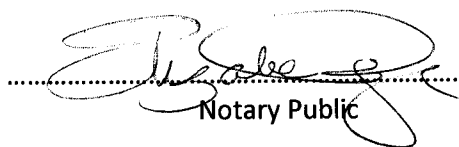
Geoffrey Delisio, Vice President

**ACKNOWLEDGMENT OF SURETY COMPANY**

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **20th** day of **February 2014**, before me personally came **AnnMarie Keane**, to me known, who, being by me duly sworn, did depose and say; that he is the Attorney-in-Fact of the **Zurich American Insurance Company** the corporation described in which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he signed his name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he signed said Instrument as an Attorney-in-Fact of said company by like authority.

  
Notary Public

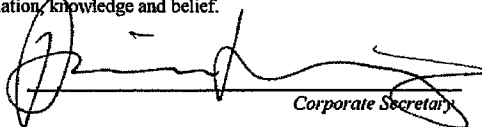
**ELIZABETH RIGA**  
**NOTARY PUBLIC OF NEW JERSEY**  
My Commission Expires on March 13, 2018



**ZURICH AMERICAN INSURANCE COMPANY**  
**COMPARATIVE BALANCE SHEET**  
**ONE LIBERTY PLAZA, 165 BROADWAY, 32nd FLOOR, NEW YORK, NY 10006**  
**As of December 31, 2012 and December 31, 2011**

	12/31/2012	12/31/2011
<b><u>Assets</u></b>		
Bonds	\$ 18,907,466,866	\$ 18,985,096,131
Preferred Stock	-	259,036
Common Stock	2,123,025,432	2,068,881,919
Other Invested Assets	2,035,077,824	2,065,634,039
Short-term Investments	126,053,209	107,298,374
Receivable for securities	134,410,839	18,523,294
Cash and cash equivalents	728,298,115	(128,716,627)
Securities lending reinvested collateral assets	225,335,750	120,821,061
Employee Trust for Deferred Compensation Plan	130,493,778	124,809,033
Total Cash and Invested Assets	<u>\$ 24,410,161,814</u>	<u>\$ 23,362,606,260</u>
 Premiums Receivable	 \$ 3,649,247,239	 \$ 3,611,868,304
Funds Held with Reinsurers	3,681,443	28,073,922
Reinsurance Recoverable	215,451,507	233,357,918
Accrued Investment Income	121,729,727	149,372,442
Federal Income Tax Recoverable	930,267,731	788,664,462
Due from Affiliates	187,274,289	95,583,016
Other Assets	493,265,075	459,639,011
Total Assets	<u>\$ 30,011,078,824</u>	<u>\$ 28,729,165,335</u>
 <b><u>Liabilities and Policyholders' Surplus</u></b>		
<b><u>Liabilities:</u></b>		
Loss and LAE Reserves	\$ 14,244,436,264	\$ 14,401,632,170
Unearned Premium Reserve	4,159,670,241	4,066,273,586
Funds Held with Reinsurers	212,412,675	218,214,563
Loss In Course of Payment	408,170,112	353,274,509
Commission Reserve	64,038,359	63,749,920
Federal Income Tax Payable	16,190,044	47,352,138
Remittances and Items Unallocated	196,410,982	69,677,903
Payable to parent, subs and affiliates	57,540,814	92,111,683
Provision for Reinsurance	66,649,220	60,498,188
Ceded Reinsurance Premiums Payable	551,510,878	278,235,370
Securities Lending Collateral Liability	225,335,750	120,821,061
Other Liabilities	2,166,453,164	1,938,544,837
Total Liabilities	<u>\$ 22,368,818,502</u>	<u>\$ 21,710,385,928</u>
 <b><u>Policyholders' Surplus:</u></b>		
Common Capital Stock	\$ 5,000,000	\$ 5,000,000
Paid-In and Contributed Surplus	4,394,131,321	4,394,131,320
Surplus Notes	430,000,000	883,000,000
Special Surplus Funds	43,259,000	396,438,437
Cumulative Unrealized Gain	331,857,594	209,454,958
Unassigned Surplus	2,438,012,408	1,130,754,692
Total Policyholders' Surplus	<u>\$ 7,642,260,323</u>	<u>\$ 7,018,779,407</u>
 Total Liabilities and Policyholders' Surplus	<u>\$ 30,011,078,824</u>	<u>\$ 28,729,165,335</u>

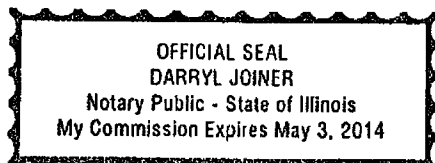
I, Dennis F. Kerrigan, Corporate Secretary of ZURICH AMERICAN INSURANCE COMPANY do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company, on the 31st day of December, 2012, according to the best of my information, knowledge and belief.

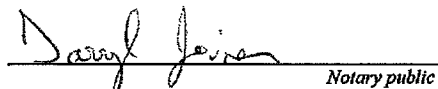
  
Corporate Secretary

State of Illinois  
County of Cook

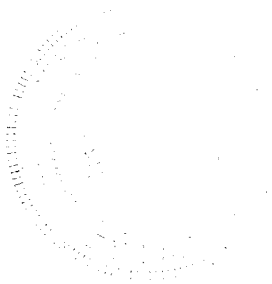
} SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2013.



  
Notary public

February 20, 2014



**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND  
POWER OF ATTORNEY**

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **THOMAS O. MCCLELLAN, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **A.C. MARQUIS, JR., William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Peter H. FORENZA, Frederick E. NICHOLSON, Robert S. RAPP JR., Joseph T. CHARCZENKO, AnnMarie KEANE and Elizabeth RIGA, all of Branchburg, New Jersey, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 4th day of February, A.D. 2013.

**ATTEST:**

**ZURICH AMERICAN INSURANCE COMPANY  
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**



*Gregory E. Murray*

By: \_\_\_\_\_

*Assistant Secretary  
Gregory E. Murray*

*Thomas O. McClellan*

*Vice President  
Thomas O. McClellan*

**State of Maryland  
City of Baltimore**

On this 4th day of February, A.D. 2013, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **THOMAS O. MCCLELLAN, Vice President, and GREGORY E. MURRAY, Assistant Secretary**, of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, depose and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

*Constance A. Dunn*

*Constance A. Dunn, Notary Public  
My Commission Expires: July 14, 2015*



## EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify or revoke any such appointment or authority at any time."

### CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 25th day of February, 2014.



*Geoffrey Delisio*

Geoffrey Delisio, Vice President

**Performance Bond #1 (Pages 80 to 83): Use if the total contract price is \$5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.**

PERFORMANCE BOND #1 (Page 2)

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to (1) pay the City the cost to complete the contract as determined by the City in excess of the balance of the Contract held by the City, plus any damages or costs to which the City is entitled, up to the full amount of the above penal sum, (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, or (3) tender a completion Contractor that is acceptable to the City. The Surety (Sureties) further agrees, at its option, either to notify the City that it elects to pay the city the cost of completion plus any applicable damages and costs under option (1) above, or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and, if the Surety elects to fully perform and complete the Work, then to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. If the Surety elects to tender payment pursuant to (1) above, then the Surety shall tender such amount within fifteen (15) business days notification from the City of the cost of completion. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and complete all Work as provided herein, or to tender a completion contractor.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, and waivers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to subcontractors shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal. Notwithstanding the above, if the City makes payments to the Principal before the time required by the contract that in the aggregate exceed \$100,000 or 10% of the Contract price, whichever is less, and that have not become earned prior to the Principal being found to be in default, then all payments made to the Principal before the time required by the Contract shall be added to the remaining contract value available to be paid for the completion of the Contract as if such sums had not been paid to the Principal, but shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and to complete all Work as provided herein, or to tender a completion contractor.



**Performance Bond #1 (Pages 80 to 83): Use if the total contract price is \$5 Million Or Less:**  
**Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA")**  
**for participation in its Bond Guarantee Program.**

PERFORMANCE BOND #1 (Page 3)

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals,  
and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be  
signed by their proper officers, this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Seal) \_\_\_\_\_ (L.S.)  
Principal

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

Bond Premium Rate \_\_\_\_\_

Bond Premium Cost \_\_\_\_\_

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly  
authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of  
counterparts of the Contract.

**Performance Bond #1 (Pages 80 to 83): Use if the total contract price is \$5 Million Or Less.**  
**Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA")**  
**for participation in its Bond Guarantee Program.**

PERFORMANCE BOND #1 (Page 4)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, before me personally came \_\_\_\_\_  
to me known, who, being by me duly sworn did depose and say that he resides at \_\_\_\_\_  
that he is the \_\_\_\_\_ of the  
corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation;  
that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said  
corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared \_\_\_\_\_  
to me known, and known to me to be one of the members of the firm of \_\_\_\_\_  
described in and who executed the foregoing instrument; and he acknowledged to me  
that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared \_\_\_\_\_  
to me known, and known to me to be the person described in and who executed the foregoing instrument; and  
acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties;  
(b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by  
agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions  
of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was  
issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

\* \* \* \* \*

Affix Acknowledgments and Justification of Sureties

**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page 1)

PERFORMANCE BOND #2

KNOW ALL PERSONS BY THESE PRESENTS, That we, \_\_\_\_\_

hereinafter referred to as the "Principal", and \_\_\_\_\_

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

(\$ \_\_\_\_\_) Dollars, lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page2)

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and/or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of failure so to do, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making good any such default, and shall protect the said City of New York against, and pay any and all amounts, damages, costs and judgments which may or shall be recovered against said City or its officers or agents of which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the doing of said work, or the repair or maintenance thereof, or the manner of doing the same, or the neglect of the said PRINCIPAL, or his (their, its) agents or servants, or the improper performance of the said work by the said PRINCIPAL, or his (their, its) agents or servants, or the infringement of any patent or patent rights by reason of the use of any materials furnished or work done as aforesaid or otherwise, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, if requested to do so by the City, to fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, if the City determines that the Principal, for any cause, has failed or neglected to fully perform and complete such Work. The Surety (Sureties) further agrees to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and to complete all Work within such time as the City may fix. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or Work to be performed thereunder, or by any payment thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page 3)

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Seal)

\_\_\_\_\_  
Principal (L.S.)

By: \_\_\_\_\_

(Seal)

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal)

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal)

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

Bond Premium Rate \_\_\_\_\_

Bond Premium Cost \_\_\_\_\_

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

**Performance Bond #2 (Pages 84 to 87): Use if the total contract price is more than \$5 Million.**

PERFORMANCE BOND #2 (Page 4)

**ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally came \_\_\_\_\_ to me known, who, being by me duly sworn did depose and say that he resides at \_\_\_\_\_ that he is the \_\_\_\_\_ of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be one of the members of the firm of \_\_\_\_\_ described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared \_\_\_\_\_ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

\* \* \* \* \*

Affix Acknowledgments and Justification of Sureties.

**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

PAYMENT BOND (Page 1)

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, That we, \_\_\_\_\_

\_\_\_\_\_

hereinafter referred to as the "Principal", and \_\_\_\_\_

\_\_\_\_\_

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

\_\_\_\_\_

(\$ \_\_\_\_\_) Dollars, lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

\_\_\_\_\_

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and assigns shall promptly pay or cause to be paid all lawful claims for

(a) Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto, whether such persons be agents servants or employees of the Principal or any such Subcontractor, including all persons so

**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

**PAYMENT BOND (Page 2)**

engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the Project regardless of any contractual relationship between the Principal or such Subcontractors, or his or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the project; and

(b) Materials and supplies (whether incorporated in the permanent structure or not), as well as teams, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be void, otherwise to remain in full force and effect.

This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialmen or laborer having a just claim, as well as the City itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and his, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other persons as party plaintiff.

(c) The Principal and Surety (Sureties) agree that neither of them will hold the City liable for any judgment for costs of otherwise, obtained by either or both of them against a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

(d) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

(e) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself and his successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the City to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed, rendered, or furnished as aforesaid upon the ground that there is no law authorizing the City to require the foregoing provisions to be placed in this bond.

And the Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties), and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due to become due thereunder and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done or in relation to said Principal.



**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

PAYMENT BOND (Page 3)

IN WITNESS HEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Seal) \_\_\_\_\_ (L.S.)  
Principal

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

(Seal) \_\_\_\_\_  
Surety

By: \_\_\_\_\_

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

**Payment Bond (Pages 88 to 91): Use for any contract for which a Payment Bond is required.**

PAYMENT BOND (Page 4)

**ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally came to me known, who, being by me duly sworn did depose and say that he resides at \_\_\_\_\_ that he is the \_\_\_\_\_ of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared to me known, and known to me to be one of the members of the firm of \_\_\_\_\_ described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

**ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL**

State of \_\_\_\_\_ County of \_\_\_\_\_ ss:

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ before me personally appeared to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

\_\_\_\_\_  
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

\* \* \* \* \*

Affix Acknowledgments and Justification of Sureties

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**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE**

**LABOR LAW §220 PREVAILING WAGE SCHEDULE**

Pursuant to Labor Law §220 (3) the Comptroller of the City of New York has promulgated this schedule solely for Workers, Laborers and Mechanics engaged by private contractors on New York City public work contracts. Contracting agencies anticipating doing work which requires the employment of a trade or classification not included in this schedule must request the Comptroller to establish a proper classification for the work pursuant to Labor Law §220 (3-a) (a). The prevailing rate schedule as promulgated by the Comptroller, must, in compliance with law, be annexed to and form part of the contract.

The appropriate schedule of prevailing wages and benefits must be posted at all public work sites pursuant to Labor Law §220 (3-a) (a).

This schedule is applicable for work performed during the effective period, unless otherwise noted. You will be notified of any changes to this schedule by addenda published on our web site at [www.comptroller.nyc.gov](http://www.comptroller.nyc.gov). The rate of wages and supplemental benefits to be paid or provided are those that prevail at the time the work is being performed. Preliminary schedules for future one-year periods are published annually in the City Record on or about June 1<sup>st</sup> of each succeeding year. Final schedules are published on or about July 1<sup>st</sup> in the City Record and on our web site at [www.comptroller.nyc.gov](http://www.comptroller.nyc.gov).

The Comptroller's Office has attempted to include all overtime, shift and night differential, Holiday, Saturday, Sunday or other premium time work. However, this schedule does not set forth every prevailing practice with respect to such rates with which employers must comply. All such practices are nevertheless part of the employer's prevailing wage obligation and contained in the collective bargaining agreements of the prevailing wage unions. These collective bargaining agreements are available for inspection by appointment. Requests for appointments may be made by calling (212) 669-4443, Monday through Friday between the hours of 9 a.m. and 5 p.m.

Answers to questions concerning prevailing trade practices may be obtained from the Classification Unit by calling (212) 669-7974. Please direct all other compliance issues to: Bureau of Labor Law, Attn: Wasyl Kinach, P.E., Office of the Comptroller, 1 Centre Street, Room 1122, New York, N.Y. 10007; Fax (212) 669-4002.

Prevailing rates and ratios for apprentices are attached to this schedule in the Appendix. Pursuant to Labor Law §220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant, registered with the New York State Department of Labor, may be employed on a public work project. Workers who are not journey persons or not registered apprentices pursuant to Labor Law §220 (3-e) may not be substituted for apprentices and must be paid as journey persons.

Workers, Laborers and Mechanics employed on a public work project must receive not less than the prevailing rate of wage and benefits for the classification of work performed by each upon such public work. Contractors are solely responsible for maintaining original payroll records which delineate, among other things, the hours each employee worked within a given classification. Contractors using rates and/or classifications not promulgated by the Comptroller do so at their own risk. Additionally, prior to bid, Agency Chief Contracting Officers must contact the Bureau of Labor Law when the need arises for a work classification not published in this schedule.

**Prevailing Rate Schedule Information:** The information below is intended to assist you in setting your prevailing wage rate obligation.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**Covered Workers:** Any and all individuals who are engaged, employed or otherwise occupied as Workers, Laborers or Mechanics on the public work site.

**Supplemental Benefits:** Employers may meet supplemental benefits obligation by paying the hourly supplemental benefits rate to their employees in cash. Such cash payments are considered income to the employee. Employers who elect to provide bona fide supplemental benefits to their employees will be given hourly cash credit for such benefits up to the hourly benefits rate set forth in the applicable schedule for the relevant trade or occupation at issue.

Particular attention should be given to the supplemental benefits requirement. Although in most instances the payment or provision for supplemental benefits is for each hour worked, some classifications require the payment or provision of supplemental benefits for each hour paid. Consequently, some prevailing practices require benefits to be purchased at the overtime, shift differential, Holiday, Saturday, Sunday or other premium time rate.

Contractors are advised to review the applicable Collective Bargaining Agreements and the Comptroller's Prevailing Wage Schedule before bidding on Public Work. If there are any questions concerning prevailing wages, benefits, overtime, Holiday pay, shift differentials or any prevailing practice, please contact this office.

Public Work construction, reconstruction, demolition, excavation, rehabilitation, repair, renovation, alteration, or improvement contracts awarded pursuant to a Project Labor Agreement ("PLA") in accordance with Labor Law section 222 may have different labor standards for shift, premium and overtime work. Please refer to the PLA's pre-negotiated labor agreements for wage and benefit rates applicable to work performed outside of the regular workday. More information is available at the Mayor's Office of Contract Services (MOCS) web page at <http://www.nyc.gov/html/mocs/html/vendors/pla.shtml>.

All the provisions of Labor Law section 220 remain applicable to PLA work including, but not limited to, the enforcement of prevailing wage requirements by the Comptroller; however, we will enforce shift, premium, overtime and other non-standard rates as they appear in a project's pre-negotiated labor agreement.

Any error as to compensation under the prevailing wage law or other information as to trade classification, made by the contracting agency in the contract documents or in any other communication, will not preclude a finding against the contractor of prevailing wage violation.

**Benefits are paid for EACH HOUR WORKED unless otherwise noted.**

Wasył Kinach, P.E.  
Director of Classifications  
Bureau of Labor Law

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**ASBESTOS HANDLER**

(Hazardous Material; Disturbs, removes, encapsulates, repairs, or encloses friable asbestos material)

**Asbestos Handler**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$35.10

Supplemental Benefit Rate per Hour: \$14.85

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Sunday.

Time and one half the regular hourly rate after 40 hours in any work week.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Easter

**Paid Holidays**

None

(Local #78)

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**BLASTER**

**Blaster**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$43.20

Supplemental Benefit Rate per Hour: \$37.29

**Blaster (Hydraulic)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$43.95

Supplemental Benefit Rate per Hour: \$37.29



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**Blaster - Trac Drill Hydraulic**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$38.96

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Wagon: Air Trac: Quarry Bar: Drillrunners**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$38.24

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Operators of Jack Hammers**

Chippers: Spaders: Concrete Breakers: and all other pneumatic tools of like usage: Walk Behind Self Propelled Hydraulic Asphalt and Concrete Breakers: Hydro (Water) Demolition

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.29

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Powder Carriers**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$33.73

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Hydraulic Trac Drill Chuck Tender**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$32.57

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Chuck Tender & Nipper**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$31.88

Supplemental Benefit Rate per Hour: \$37.29

**Blaster - Magazine Keepers: (Watch Person)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$19.26

Supplemental Benefit Rate per Hour: \$37.29

**Overtime Description**

**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE**

**For Blaster - Magazine Keepers: (Watch Person) only - time and one half the regular rate for work after an 8 hour day, Saturday, Sunday and holidays listed below.**

**Overtime**

Double time the regular rate after an 8 hour day.  
Time and one half the regular rate for Saturday.  
Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

A single shift shall be 8 hours plus an unpaid lunch, starting at 8:00 A.M (or between 6:00 A.M. and 10:00 A.M. on weekdays). When two (2) shifts are employed, each shift shall be 8 hours plus ½ hour unpaid lunch. When three shifts are employed, each shift will work seven and one-half (7 ½) hours, but will be paid for eight (8) hours, since only one-half (½) hour is allowed for mealtime. When two (2) or more shifts are employed, single time will be paid for each shift. The first 8 hours of any and all work performed Monday through Friday inclusive of any off-shift shall be at the single time rate.

(Local #29)

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**BOILERMAKER**

**Boilermaker**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$47.98

Supplemental Benefit Rate per Hour: \$37.88

Supplemental Note: The above rate applies to repair or maintenance and new construction; For time and one half overtime - \$56.36; For double overtime - \$74.86.

**Overtime Description**

For Repair and Maintenance work:

Time and one half the regular rate after an 8 hour day.  
Time and one half the regular rate for Saturday.  
Double time the regular rate for Sunday.

New Construction work:

Double time the regular rate after an 8 hour day.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

Quadruple time the regular rate for work on the following holiday(s).

Labor Day

### Paid Holidays

Good Friday

Day after Thanksgiving

Day before Christmas

Day before New Year's Day

### Shift Rates

When shifts are required, the first shift shall work eight (8) hours at the regular straight-time hourly rate. The second shift shall work seven and one-half (7 ½) hours and receive eight hours at the regular straight time hourly rate plus twenty-five cents (\$0.25) per hour. The third shift shall work seven (7) hours and receive eight hours at the regular straight time hourly rate plus fifty cents (\$0.50) per hour. A thirty (30) minute lunch period shall not be considered as time worked. Work in excess of the above shall be paid overtime at the appropriate new construction work or repair work overtime wage and supplemental benefit hourly rate.

(Local #5)

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## BRICKLAYER

### Bricklayer

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$46.44

Supplemental Benefit Rate per Hour: \$27.53

### Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

Overtime rates to be paid outside the regular scheduled work day.

(Bricklayer District Council)

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**CARPENTER - BUILDING COMMERCIAL**

**Building Commercial**

Effective Period: 7/1/2012 - 6/30/2013

Base Rate per Hour: \$46.15

Supplemental Benefit Rate per Hour: \$38.50

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
Washington's Birthday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Paid Holidays**

None

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

### Shift Rates

The second shift will receive one hour at the double time rate of pay for the last hour of the shift; eight hours pay for seven hours of work, nine hours pay for eight hours of work. There must be a first shift in order to work a second shift.

(Carpenters District Council)

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## CARPENTER - HEAVY CONSTRUCTION WORK (Construction of Engineering Structures and Building Foundations)

### Heavy Construction Work

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$46.74

Supplemental Benefit Rate per Hour: \$42.37

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### Paid Holidays

None

### Shift Rates

Off shift work, commencing between 5:00 P.M. and 10:00 P.M. shall work eight and one half hours allowing for one half hour for lunch, but will be paid for 9 hours including benefits at the straight time rate for 8 hours.

(Carpenters District Council)

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

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**CEMENT & CONCRETE WORKER**

**Cement & Concrete Worker**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$38.98

Supplemental Benefit Rate per Hour: \$25.67

Supplemental Note: \$28.42 on Saturdays; \$31.17 on Sundays & Holidays

**Overtime Description**

Time and one half the regular rate after 7 hour day (time and one half the regular rate after an 8 hour day when working with Dockbuilders on pile cap forms and for work below street level to the top of the foundation wall, not to exceed 2 feet or 3 feet above the sidewalk-brick shelf, when working on the foundation and structure.)

**Overtime**

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

1/2 day before Christmas Day

1/2 day before New Year's Day

**Shift Rates**

On shift work extending over a twenty-four hour period, all shifts are paid at straight time.

(Cement Concrete Workers District Council)

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**CEMENT MASON**

**Cement Mason**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$42.50

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: **\$39.06**

Supplemental Note: Overtime supplemental benefit rate per hour: **\$57.56**

### **Overtime**

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

### **Shift Rates**

For an off shift day, (work at times other than the regular 7:00 A.M. to 3:30 P.M. work day) a cement mason shall be paid at the regular hourly rate plus a 25% per hour differential.

(Local #780)

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## **CORE DRILLER**

### **Core Driller**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$35.44**

Supplemental Benefit Rate per Hour: **\$19.75**

### **Core Driller Helper**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$28.60**

Supplemental Benefit Rate per Hour: **\$19.75**

### **Core Driller Helper(Third year in the industry)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.74

Supplemental Benefit Rate per Hour: \$19.75

**Core Driller Helper (Second year in the industry)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$22.88

Supplemental Benefit Rate per Hour: \$19.75

**Core Driller Helper (First year in the industry)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.02

Supplemental Benefit Rate per Hour: \$19.75

**Overtime Description**

Time and one half the regular rate for work on a holiday plus Holiday pay when worked.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Shift Rates**

The shift day shall be the continuous eight and one-half (8½) hours from 6:00 A.M. to 2:30 P.M. and from 2:30 P.M. to 11:00 P.M., including one-half (½) hour of employees regular rate of pay for lunch. When two (2) or more shifts are employed, single time shall be paid for each shift, but those employees employed on a shift other than from 8:00 A.M. to 5:00 P.M. shall, in addition, receive seventy-five cents (\$0.75) per hour differential for each hour worked. When three (3) shifts are needed, each shift shall work seven and one-half (7 ½) hours paid for eight (8) hours of labor and be permitted one-half (½) hour for mealtime.

(Carpenters District Council)

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**DERRICKPERSON AND RIGGER**

**Derrick Person & Rigger**



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$40.50

Supplemental Benefit Rate per Hour: \$42.07

Supplemental Note: The above supplemental rate applies for work performed in Manhattan, Bronx, Brooklyn and Queens. \$43.49 - For work performed in Staten Island.

**Derrick Person & Rigger - Site Work**

For site work where no rigging is involved.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$30.00

Supplemental Benefit Rate per Hour: \$31.32

**Overtime Description**

The first two hours of overtime on weekdays and the first seven hours of work on Saturdays are paid at time and one half for wages and supplemental benefits. All additional overtimes is paid at double time for wages and supplemental benefits. Deduct \$1.42 from the Staten Island hourly benefits rate before computing overtime.

**Overtime**

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

1/2 day on Christmas Eve if work is performed in the A.M.

(Local #197)

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**DIVER**

**Diver (Marine)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$58.95

Supplemental Benefit Rate per Hour: \$42.37

**Diver Tender (Marine)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$42.10

Supplemental Benefit Rate per Hour: \$42.37

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### Paid Holidays

One

### Shift Rates

When three shifts are utilized each shift shall work seven and one half-hours (7 1/2 hours) and paid for 8 hours, allowing for one half hour for lunch.

(Carpenters District Council)

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## DOCKBUILDER - PILE DRIVER

### Dockbuilder - Pile Driver

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$46.74

Supplemental Benefit Rate per Hour: \$42.37

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Christmas Day

### Paid Holidays

None

### Shift Rates

Off shift work, commencing between 5:00 P.M. and 10:00 P.M., shall work eight and one half hours allowing for one half hour for lunch but will be paid the straight time hourly wage for 9 hours and the straight time supplemental benefits for 8 hours.

(Carpenters District Council)

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## DRIVER: TRUCK (TEAMSTER)

### Driver - Automobile Chauffeur (Dump Truck)

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$35.84

Supplemental Benefit Rate per Hour: \$36.93

### Driver - Heavy Equipment Trailer Driver

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.34

Supplemental Benefit Rate per Hour: \$36.93

Note: For time and one half overtime Wage Rate - \$53.76; for double time overtime Wage Rate - \$71.68

### Driver - Euclid & Turnapull Operator

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.41

Supplemental Benefit Rate per Hour: \$36.93

### Driver - Six Wheeler(3 Axle) Tractors & Trailers

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.84

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: \$36.93

Note: For time and one half overtime Wage Rate - \$54.62; for double time overtime Wage Rate - \$72.82

**Driver - Boom Truck**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.09

Supplemental Benefit Rate per Hour: \$36.93

Note: For time and one half overtime Wage Rate - \$54.62; for double time overtime Wage Rate - \$72.82

**Overtime Description**

For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay. For Thanksgiving week, the prorated share shall be 5 1/3 hours of holiday pay for each day worked in Thanksgiving week.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

President's Day

Columbus Day

Veteran's Day

Day after Thanksgiving

Triple time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Presidential Election Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

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**Driver - Redi-Mix Driver (Sand & Gravel)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.47

Supplemental Benefit Rate per Hour: \$38.65

**Overtime Description**

For Paid Holidays: Employees working two (2) days in the calendar week in which the holiday falls are to paid for these holidays, provided they shape each remaining workday during that calendar week.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

President's Day

Columbus Day

Veteran's Day

Triple time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

(Local #282)

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**ELECTRICIAN**

(Including all low voltage cabling carrying data; video; and voice in combination with data and or video.)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

**Electrician "A" (Regular Day)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$51.00

Supplemental Benefit Rate per Hour: \$42.45

**Electrician "A" (Regular Day Overtime)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$76.50

Supplemental Benefit Rate per Hour: \$45.13

**Electrician "A" (Day Shift)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$51.00

Supplemental Benefit Rate per Hour: \$42.45

**Electrician "A" (Day Shift Overtime After 8 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$76.50

Supplemental Benefit Rate per Hour: \$45.13

**Electrician "A" (Swing Shift)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$59.84

Supplemental Benefit Rate per Hour: \$48.20

**Electrician "A" (Swing Shift Overtime After 7.5 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$89.76

Supplemental Benefit Rate per Hour: \$51.36

**Electrician "A" (Graveyard Shift)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$67.03

Supplemental Benefit Rate per Hour: \$53.07

**Electrician "A" (Graveyard Shift Overtime After 7 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$100.55

Supplemental Benefit Rate per Hour: \$56.60

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**Overtime**

Time and one half the regular rate after a 7 hour day.  
Time and one half the regular rate for Saturday.  
Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on a holiday.  
New Year's Day  
Martin Luther King Jr. Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

When so elected by the Employer, one or more shifts of at least five days duration may be scheduled as follows:  
Day Shift: 8:00 am to 4:30 pm, Swing Shift 4:30 pm to 12:30 am, Graveyard Shift: 12:30 am to 8:00 am.

For multiple shifts of temporary light and/or power, the temporary light and/or power employee shall be paid for 8 hours at the straight time rate.

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**Electrician "M" (First 8 hours)**

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.30

Supplemental Benefit Rate per Hour: \$17.52

**Electrician "M" (Overtime After First 8 hours)**

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.95

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Supplemental Benefit Rate per Hour: \$18.85

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Paid Holidays**

None

(Local #3)

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**ELECTRICIAN - ALARM TECHNICIAN**

(Scope of Work - Inspect, test, repair, and replace defective, malfunctioning, or broken devices, components and controls of Fire, Burglar and Security Systems)

**Alarm Technician**

Effective Period: 7/1/2012 – 3/9/2013

Wage Rate per Hour: \$29.90

Supplemental Benefit Rate per Hour: \$13.70

Supplemental Note: \$12.20 only after 8 hours worked in a day

Effective Period: 3/10/2013 - 6/30/2013

Wage Rate per Hour: \$30.40

Supplemental Benefit Rate per Hour: \$13.90

Supplemental Note: \$12.40 only after 8 hours worked in a day

**Overtime Description**

Time and one half the regular rate for work on the following holidays: Columbus Day, Veterans Day, Day after Thanksgiving.



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Double time the regular rate for work on the following holidays: New Year's day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### Paid Holidays

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veterans Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

### Shift Rates

Night Differential is based upon a ten percent (10%) differential between the hours of 4:00 P.M. and 12:30 A.M. and a fifteen percent (15%) differential for the hours 12:00 A.M. to 8:00 A.M.

### Vacation

At least 1 year of employment.....ten (10) days

5 years or more of employment.....fifteen (15) days

10 years of employment.....twenty (20) days

Plus one Personal Day per year

Sick Days:

One day per Year

(Local #3)

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## ELECTRICIAN-STREET LIGHTING WORKER

### Electrician - Electro Pole Electrician

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$51.00

Supplemental Benefit Rate per Hour: \$44.18

### Electrician - Electro Pole Foundation Installer

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$38.66

Supplemental Benefit Rate per Hour: \$34.12

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**Electrician - Electro Pole Maintainer**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$33.10

Supplemental Benefit Rate per Hour: \$30.84

**Overtime Description**

Electrician - Electro Pole Electrician: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week.

Electrician - Electro Pole Foundation Installer: Time and one half the regular rate after 8 hours within a 24 hour period and Saturday and Sunday.

Electrician - Electro Pole Maintainer: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week. Saturdays and Sundays may be used as a make-up day at straight time when a day is lost during the week to inclement weather.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Paid Holidays**

None

(Local #3)

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**ELEVATOR CONSTRUCTOR**

**Elevator Constructor**

Effective Period: 7/1/2012 - 3/16/2013

Wage Rate per Hour: \$55.20

Supplemental Benefit Rate per Hour: \$32.78

Effective Period: 3/17/2013- 6/30/2013

Wage Rate per Hour: \$57.01

Supplemental Benefit Rate per Hour: \$34.48

**Overtime Description**

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**For New Construction:** work performed after 7 or 8 hour day, Saturday, Sunday or between 4:30pm and 7:00am shall be paid at double time rate.

**Existing buildings:** work performed after an 8 hour day, Saturday, Sunday or between 5:30pm and 7:00 am shall be paid time and one half.

### **Overtime**

Double time the regular rate for work on the following holiday(s).

### **Paid Holidays**

New Year's Day  
President's Day  
Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

### **Vacation**

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

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## **ELEVATOR REPAIR & MAINTENANCE**

### **Elevator Service/Modernization Mechanic**

**Effective Period: 7/1/2012 – 3/16/2013**

**Wage Rate per Hour: \$43.79**

**Supplemental Benefit Rate per Hour: \$31.37**

**Effective Period: 3/17/2013 - 6/30/2013**

**Wage Rate per Hour: \$45.14**

**Supplemental Benefit Rate per Hour: \$33.02**

### **Overtime Description**

**For Service Work:** Double time - all work performed on Sundays, Holidays, and between midnight and 7:00am.

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Time and one half the regular rate for work on a holiday plus the day's pay.

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**Paid Holidays**

New Year's Day  
President's Day  
Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Shift Rates**

For Modernization Work (4pm to 12:30am) - regularly hourly rate plus a (15%) fifteen percent differential.

**Vacation**

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

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**ENGINEER**

**Engineer - Heavy Construction Operating Engineer I**

Cherry pickers 20 tons and over and Loaders (rubber tired and/or tractor type with a manufacturer's minimum rated capacity of six cubic yards and over).

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$58.75

Supplemental Benefit Rate per Hour: \$31.07

Supplemental Note: \$55.74 on overtime

Shift Wage Rate: \$94.00

**Engineer - Heavy Construction Operating Engineer II**

Backhoes, Basin Machines, Groover, Mechanical Sweepers, Bobcat, Boom Truck, Barrier Transport (Barrier Mover) & machines of similar nature. Operation of Churn Drills and machines of a similar nature, Stetco Silent Hoist and machines of similar nature, Vac-Alls, Meyers Machines, John Beam and machines of a similar nature, Ross Carriers and Travel Lifts and machines of a similar nature, Bulldozers, Scrapers and Turn-a-Pulls: Tugger Hoists (Used exclusively for handling excavated material); Tractors with attachments, Hyster and Roustabout Cranes, Cherry pickers. Austin Western, Grove and machines of a similar nature, Scoopmobiles, Monorails, Conveyors, Trenchers: Loaders-Rubber Tired and Tractor: Barber Greene and Eimco Loaders and Eimco Backhoes; Mighty Midget and similar breakers and Tampers, Curb and Gutter Pavers and Motor Patrol, Motor Graders and all machines of a similar nature. Locomotives 10 Tons or under. Mini-Max, Break-Tech and machines of a similar nature; Milling machines, robotic and demolition machines and machines of a similar

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nature, shot blaster, skid steer machines and machines of a similar nature including bobcat, pile rig rubber-tired excavator (37,000 lbs. and under), 2 man auger.

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$57.00**

**Supplemental Benefit Rate per Hour: \$31.07**

**Supplemental Note: \$55.74 on overtime**

**Shift Wage Rate: \$91.20**

**Engineer - Heavy Construction Maintenance Engineer I**

Installing, Repairing, Maintaining, Dismantling and Manning of all equipment including Steel Cutting, Bending and Heat Sealing Machines, Mechanical Heaters, Grout Pumps, Bentonite Pumps & Plants, Screening Machines, Fusion Coupling Machines, Tunnel Boring Machines Moles and Machines of a similar nature, Power Packs, Mechanical Hydraulic Jacks; all drill rigs including but not limited to Churn, Rotary Caisson, Raised Bore & Drills of a similar nature; Personnel, Inspection & Safety Boats or any boats used to perform functions of same, Mine Hoists, Whirlies, all Climbing Cranes, all Tower Cranes, including but not limited to Truck Mounted and Crawler Type and machines of similar nature; Maintaining Hydraulic Drills and machines of a similar nature; Well Point System-Installation and dismantling; Burning, Welding, all Pumps regardless of size and/or motor power, except River Cofferdam Pumps and Wells Point Pumps; Motorized Buggies (three or more); equipment used in the cleaning and televising of sewers, but not limited to jet-rodder/vacuum truck, vacall/vactor, closed circuit television inspection equipment; high powered water pumps, jet pumps; screed machines and concrete finishing machines of a similar nature; vermeers.

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$56.74**

**Supplemental Benefit Rate per Hour: \$31.07**

**Supplemental Note: \$55.74 on overtime**

**Shift Wage Rate: \$90.78**

**Engineer - Heavy Construction Maintenance Engineer II**

**On Base Mounted Tower Cranes**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$74.44**

**Supplemental Benefit Rate per Hour: \$31.07**

**Supplemental Note: \$55.74 on overtime**

**Shift Wage Rate: \$119.10**

**Engineer - Heavy Construction Maintenance Engineer III**

**On Generators, Light Towers**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$37.56**

**Supplemental Benefit Rate per Hour: \$31.07**

**Supplemental Note: \$55.74 on overtime**

**Shift Wage Rate: \$60.10**

**Engineer - Heavy Construction Maintenance Engineer IV**

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**Pumps and Mixers including mud sucking**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$38.53**

Supplemental Benefit Rate per Hour: **\$31.07**

Supplemental Note: \$55.74 on overtime

Shift Wage Rate: **\$61.65**

**Engineer - Heavy Construction Operating Engineer III**

Minor Equipment such as Tractors, Post Hole Diggers, Ditch Witch (Walk Behind), Road Finishing Machines, Rollers five tons and under, Tugger Hoists, Dual Purpose Trucks, Fork Lifts, and Dempsey Dumpers, Fireperson.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$54.09**

Supplemental Benefit Rate per Hour: **\$31.07**

Supplemental Note: \$55.74 on overtime

Shift Wage Rate: **\$86.54**

**Engineer - Heavy Construction Oilers I**

Gradalls, Cold Planer Grader, Concrete Pumps, Driving Truck Cranes, Driving and Operating Fuel and Grease Trucks.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$51.19**

Supplemental Benefit Rate per Hour: **\$31.07**

Supplemental Note: \$55.74 on overtime

Shift Wage Rate: **\$81.90**

**Engineer - Heavy Construction Oilers II**

All gasoline, electric, diesel or air operated Shovels, Draglines, Backhoes, Keystones, Pavers, Guniting Machines, Battery of Compressors, Crawler Cranes, two-person Trenching Machines.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$35.50**

Supplemental Benefit Rate per Hour: **\$31.07**

Supplemental Note: \$55.74 on overtime

Shift Wage Rate: **\$56.80**

**Engineer - Steel Erection Maintenance Engineers**

Derrick, Travelers, Tower, Crawler Tower and Climbing Cranes

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$54.33**

Supplemental Benefit Rate per Hour: **\$29.66**

Supplemental Note: \$53.17 on overtime

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Shift Wage Rate: \$86.93

**Engineer - Steel Erection Oiler I**

On a Truck Crane

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.91

Supplemental Benefit Rate per Hour: \$29.66

Supplemental Note: \$53.17 on overtime

Shift Wage Rate: \$81.46

**Engineer - Steel Erection Oiler II**

On a Crawler Crane

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$39.04

Supplemental Benefit Rate per Hour: \$29.66

Supplemental Note: \$53.17 on overtime

Shift Wage Rate: \$62.46

**Overtime Description**

On jobs of more than one shift, if the next shift employee fails to report for work through any cause over which the employer has no control, the employee on duty who works the next shift continues to work at the single time rate.

**Overtime**

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

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**Engineer - Building Work Maintenance Engineers I**

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installing, repairing, maintaining, dismantling (of all equipment including: Steel Cutting and Bending Machines, Mechanical Heaters, Mine Hoists, Climbing Cranes, Tower Cranes, Linden Peine, Lorain, Liebherr, Mannes, or machines of a similar nature, Well Point Systems, Deep Well Pumps, Concrete Mixers with loading Device, Concrete Plants, Motor Generators when used for temporary power and lights), skid steer machines of a similar nature including bobcat.

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$51.62**

**Supplemental Benefit Rate per Hour: \$29.66**

**Supplemental Note: \$53.17 on overtime**

**Engineer - Building Work Maintenance Engineers II**

**On Pumps, Generators, Mixers and Heaters**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$40.34**

**Supplemental Benefit Rate per Hour: \$29.66**

**Supplemental Note: \$53.17 on overtime**

**Engineer - Building Work Oilers I**

**All gasoline, electric, diesel or air operated Gradealls: Concrete Pumps, Overhead Cranes in Power Houses: Their duties shall be to assist the Engineer in oiling, greasing and repairing of all machines; Driving Truck Cranes: Driving and Operating Fuel and Grease Trucks, Cherrypickers (hydraulic cranes) over 70,000 GVW, and machines of a similar nature.**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$49.12**

**Supplemental Benefit Rate per Hour: \$29.66**

**Supplemental Note: \$53.17 on overtime**

**Engineer - Building Work Oilers II**

**Oilers on Crawler Cranes, Backhoes, Trenching Machines, Guniting Machines, Compressors (three or more in Battery).**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$36.75**

**Supplemental Benefit Rate per Hour: \$29.66**

**Supplemental Note: \$53.17 on overtime**

**Overtime Description**

**On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.**

**Overtime**

**Double time the regular rate after an 8 hour day.**

**Double time the regular time rate for Saturday.**

**Double time the regular rate for Sunday.**



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Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day  
Lincoln's Birthday  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

**Shift Rates**

Off Shift: double time the regular hourly rate.

(Local #15)

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**ENGINEER - CITY SURVEYOR AND CONSULTANT**

**Party Chief**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$34.61

Supplemental Benefit Rate per Hour: \$17.30

**Instrument Person**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$28.59

Supplemental Benefit Rate per Hour: \$17.30

**Rodperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$24.79

Supplemental Benefit Rate per Hour: \$17.30

**Overtime Description**

Overtime Benefit Rate - \$23.63 per hour (time & one half) \$29.95 per hour (double time).

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

**Paid Holidays**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

New Year's Day  
Lincoln's Birthday  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Operating Engineer Local #15-D

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**ENGINEER - FIELD (BUILDING CONSTRUCTION)**  
(Construction of Building Projects, Concrete Superstructures, etc.)

**Field Engineer - BC Party Chief**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$53.64

Supplemental Benefit Rate per Hour: \$26.95

Supplemental Note: Overtime Benefit Rate - \$37.48 per hour (time & one half) \$48.00 per hour (double time).

**Field Engineer - BC Instrument Person**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$41.94

Supplemental Benefit Rate per Hour: \$26.95

Supplemental Note: Overtime Benefit Rate - \$37.48 per hour (time & one half) \$48.00 per hour (double time).

**Field Engineer - BC Rodperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.52

Supplemental Benefit Rate per Hour: \$26.95

Supplemental Note: Overtime Benefit Rate - \$37.48 per hour (time & one half) \$48.00 per hour (double time).

**Overtime Description**

Time and one half the regular rate after a 7 hour work and time and one half the regular rate for Saturday for the first seven hours worked, Double time the regular time rate for Saturday for work performed in excess of seven hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

**Paid Holidays**

New Year's Day  
President's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Operating Engineer Local #15-D

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**ENGINEER - FIELD (HEAVY CONSTRUCTION)**  
(Construction of Roads, Tunnels, Bridges, Sewers, Building Foundations,  
Engineering Structures etc.)

**Field Engineer - HC Party Chief**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$60.28

Supplemental Benefit Rate per Hour: \$29.73

Supplemental Note: Overtime benefit rate - \$41.40 per hour (time & one half), \$53.06 per hour (double time).

**Field Engineer - HC Instrument Person**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$44.28

Supplemental Benefit Rate per Hour: \$29.73

Supplemental Note: Overtime benefit rate - \$41.40 per hour (time & one half), \$53.06 per hour (double time).

**Field Engineer - HC Rodperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.11

Supplemental Benefit Rate per Hour: \$29.73

Supplemental Note: Overtime benefit rate - \$41.40 per hour (time & one half), \$53.06 per hour (double time).

**Overtime Description**

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

**Paid Holidays**

New Year's Day  
Lincoln's Birthday  
President's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Operating Engineer Local #15-D

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**ENGINEER - FIELD (STEEL ERECTION)**

**Field Engineer - Steel Erection Party Chief**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$54.50**

Supplemental Benefit Rate per Hour: **\$26.95**

Supplemental Note: Overtime benefit rate - \$37.48 per hour (time & one half), \$48.00 per hour (double time).

**Field Engineer - Steel Erection Instrument Person**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$42.63**

Supplemental Benefit Rate per Hour: **\$26.95**

Supplemental Note: Overtime benefit rate - \$37.48 per hour (time & one half), \$48.00 per hour (double time).

**Field Engineer - Steel Erection Rodperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$28.84**

Supplemental Benefit Rate per Hour: **\$26.95**

Supplemental Note: Overtime benefit rate - \$37.48 per hour (time & one half), \$48.00 per hour (double time).

**Overtime Description**

Time and one half the regular rate for Saturday for the first eight hours worked.

Double time the regular rate for Saturday for work performed in excess of eight hours.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day  
Lincoln's Birthday  
President's Day  
Memorial Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Local #15-D)

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## ENGINEER - OPERATING

### Operating Engineer - Road & Heavy Construction I

Back Filling Machines, Cranes, Mucking Machines and Dual Drum Paver.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$64.38

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$103.01

### Operating Engineer - Road & Heavy Construction II

Backhoes, Power Shovels, Hydraulic Clam Shells, Steel Erection, Moles and machines of a similar nature.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$66.70

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: 51.85 overtime hours

Shift Wage Rate: \$106.72

### Operating Engineer - Road & Heavy Construction III

Mine Hoists, Cranes, etc. (Used as Mine Hoists)

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$68.86

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$110.18

### Operating Engineer - Road & Heavy Construction IV

Gradealls, Keystones, Cranes on land or water (with digging buckets), Bridge Cranes, Vermeer Cutter and machines of a similar nature, Trenching Machines.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$67.21

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$107.54

**Operating Engineer - Road & Heavy Construction V**

Pile Drivers & Rigs (employing Dock Builder foreperson): Derrick Boats, Tunnel Shovels.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$65.86

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$105.38

**Operating Engineer - Road & Heavy Construction VI**

Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power Houses (Low Air Pressure Units).

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$62.51

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$100.02

**Operating Engineer - Road & Heavy Construction VII**

Barrier Movers , Barrier Transport and Machines of a Similar Nature.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.27

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$80.43

**Operating Engineer - Road & Heavy Construction VIII**

Utility Compressors

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.37

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$46.38

**Operating Engineer - Road & Heavy Construction IX**

Horizontal Boring Rig

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$56.24

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$89.98

**Operating Engineer - Road & Heavy Construction X**

Elevators (manually operated as personnel hoist).

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$54.50

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$87.20

**Operating Engineer - Road & Heavy Construction XI**

Compressors (Portable 3 or more in battery), Driving of Truck Mounted Compressors, Well-point Pumps, Tugger Machines Well Point Pumps, Churn Drill.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$42.11

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$67.38

**Operating Engineer - Road & Heavy Construction XII**

All Drills and Machines of a similar nature.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$63.18

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$101.09

**Operating Engineer - Road & Heavy Construction XIII**

Concrete Pumps, Concrete Plant, Well Drilling Machines, Stone Crushers, Double Drum Hoist, Power Houses (other than above).

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$61.14

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$97.82

**Operating Engineer - Road & Heavy Construction XIV**

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**Concrete Mixer**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$58.34

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$93.49

**Operating Engineer - Road & Heavy Construction XV**

Compressors (Portable Single or two in Battery, not over 100 feet apart), Pumps (River Cofferdam) and Welding Machines, Push Button Machines, All Engines Irrespective of Power (Power-Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$39.03

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$62.45

**Operating Engineer - Road & Heavy Construction XVI**

Concrete Breaking Machines, Single Drum Hoists, Locomotives (over ten tons) and Dinkies over ten tons, Hydraulic Crane-Second Engineer.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$55.73

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$89.17

**Operating Engineer - Road & Heavy Construction XVII**

On-Site concrete plant engineer, On-site Asphalt Plant Engineer, and Vibratory console.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$56.19

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$89.90

**Operating Engineer - Road & Heavy Construction XVIII**

**Tower Crane**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$81.09

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Shift Wage Rate: \$129.74

**Operating Engineer - Paving I**

Asphalt Spreaders, Autogrades (C.M.I.), Roto/Mil

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$59.25

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$94.80

**Operating Engineer - Paving II**

Asphalt Roller

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$57.65

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$92.24

**Operating Engineer - Paving III**

Asphalt Plants

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$48.46

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$77.54

**Operating Engineer - Concrete I**

Cranes

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$63.49

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Concrete II**

Compressors

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.91

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

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**Operating Engineer - Concrete III**

Micro-traps (Negative Air Machines), Vac-All Remediation System.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.31

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Steel Erection I**

Three Drum Derricks

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$67.62

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$108.19

**Operating Engineer - Steel Erection II**

Cranes, 2 Drum Derricks, Hydraulic Cranes and Fork Lifts.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$64.91

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$103.86

**Operating Engineer - Steel Erection III**

Compressors, Welding Machines.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.87

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$60.59

**Operating Engineer - Steel Erection IV**

Compressors - Not Combined with Welding Machine.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.00

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$57.60

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**Operating Engineer - Building Work I**

Forklifts, House Cars, Rack and Pinion, Plaster (Platform machine), Plaster Bucket, Concrete Pump and all other equipment used for hoisting material.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$53.09

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Building Work II**

Compressors, Welding Machines (Cutting Concrete-Tank Work), Paint Spraying, Sandblasting, Pumps (with the exclusion of Concrete Pumps), House Car (settlement basis only), All Engines irrespective of Power (Power-Pac) used to drive Auxiliary Equipment, Air, Hydraulic, etc.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$39.35

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Building Work III**

Double Drum

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$60.66

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Building Work IV**

Stone Derrick, Cranes, Hydraulic Cranes Boom Trucks.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$64.35

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Building Work V**

Dismantling and Erection of Cranes, Relief Engineer.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$59.17

Supplemental Benefit Rate per Hour: \$28.65

Supplemental Note: \$51.85 overtime hours

**Operating Engineer - Building Work VI**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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**1 Pole Hoist, Single Drum Hoists.**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$58.53**

Supplemental Benefit Rate per Hour: **\$28.65**

Supplemental Note: \$51.85 overtime hours

**Overtime Description**

On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

**Overtime**

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

**Shift Rates**

Shifts may be worked at the single time rate at other than the regular working hours (8:00 A.M. to 4:30 P.M.) on the following work ONLY: Heavy construction jobs on work below the street level, over railroad tracks and on building jobs.

Operating Engineer Local #14)

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**FLOOR COVERER**

(Interior vinyl composition tile, sheath vinyl linoleum and wood parquet tile including site preparation and synthetic turf not including site preparation)

**Floor Coverer**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$46.15**

Supplemental Benefit Rate per Hour: **\$38.50**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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### **Overtime**

Time and one half the regular rate after an 8 hour day.  
Time and one half the regular rate for Saturday.  
Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

### **Paid Holidays**

1/2 day on Christmas Eve if work is performed in the A.M.  
1/2 day on New Year's Eve if work is performed in the A.M.

### **Shift Rates**

Two shifts may be utilized with the first shift working 8:00 A.M. to the end of the shift at the straight time of pay. The second shift will receive one hour at double time rate for the last hour of the shift. (eight for seven, nine for eight).

(Carpenters District Council)

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## **GLAZIER**

(New Construction, Remodeling, and Alteration)

### **Glazier**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate per Hour: \$40.00

Supplemental Benefit Rate per Hour: \$32.89

Supplemental Note: Supplemental Benefit Overtime Rate: \$40.54

Effective Period: 11/1/2012 - 6/30/2013

Wage Rate per Hour: \$40.50

Supplemental Benefit Rate per Hour: \$33.24

Supplemental Note: Supplemental Benefit Overtime Rate: \$41.24

### **Overtime Description**

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An optional 8th hour can be worked at straight time rate. If 9th hour is worked, then both hours or more (8th & 9th or more) will be at the double time rate of pay.

**Overtime**

Double time the regular rate after a 7 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Paid Holidays**

None

**Shift Rates**

Shifts shall be any 7 hours beyond 4:00 P.M. for which the glazier shall receive 8 hours pay for 7 hours worked.

Local #1281)

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**GLAZIER - REPAIR & MAINTENANCE**

(For the Installation of Glass - All repair and maintenance work on a particular building, whenever performed, where the total cumulative contract value is under \$105,000. Except where enumerated (i.e. plate glass windows) does not apply to non-residential buildings.)

**Craft Jurisdiction for repair, maintenance and fabrication**

Plate glass replacement, Residential glass replacement, Residential mirrors and shower doors, Storm windows and storm doors, Residential replacement windows, Herculite door repairs, Door closer repairs, Retrofit apartment house (non commercial buildings), Glass tinting.

Effective Period: 7/1/2012 - 4/30/2013

Wage Rate per Hour: **\$23.40**

Supplemental Benefit Rate per Hour: **\$18.04**

Effective Period: 5/1/2013 - 6/30/2013

Wage Rate per Hour: **\$23.50**

Supplemental Benefit Rate per Hour: **\$18.54**

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### **Overtime**

Time and one half the regular rate after an 8 hour day.

Double time the regular rate for Sunday.

Time and one half the regular hourly rate after 40 hours in any work week.

### **Paid Holidays**

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

(Local #1281)

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## **HEAT AND FROST INSULATOR**

### **Heat & Frost Insulator**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$54.28

Supplemental Benefit Rate per Hour: \$31.36

### **Overtime Description**

Double time shall be paid for supplemental benefits during overtime work.

8th hour paid at time and one half.

### **Overtime**

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

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Double time the regular rate for work on the following holiday(s).  
Labor Day

### **Paid Holidays**

None

### **Shift Rates**

The first shift shall work seven hours at the regular straight time rate. The second and third shift shall work seven hours the regular straight time hourly rate plus a fourteen percent wage and benefit premium. Off hour work in occupied or retail buildings may be worked on weekdays with an increment of \$1.00 per hour and eight hours pay for seven (7) hours worked. Double time will apply for over seven (7) hours worked on weekdays, weekends or holidays.

(Local #12)

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## **HOUSE WRECKER (TOTAL DEMOLITION)**

### **House Wrecker - Tier A**

On all work sites the first, second, eleventh and every third House Wrecker thereafter shall be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). The 10th and 20th House Wrecker shall be apprentices. Other House Wreckers shall be Tier B House Wreckers.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$33.00

Supplemental Benefit Rate per Hour: \$24.15

### **House Wrecker - Tier B**

On all work sites the first, second, eleventh and every third House Wrecker thereafter shall be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). The 10th and 20th House Wrecker shall be apprentices. Other House Wreckers shall be Tier B House Wreckers.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$23.05

Supplemental Benefit Rate per Hour: \$17.85

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).



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New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

(Mason Tenders District Council)

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**IRON WORKER - ORNAMENTAL**

**Iron Worker - Ornamental**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$41.50

Supplemental Benefit Rate per Hour: \$39.52

Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

**Overtime Description**

Time and one half the regular rate after a 7 hour day for a maximum of two hours on any regular work day (the 8th and 9th hour) and double time shall be paid for all work on a regular work day thereafter, time and one half the regular rate for Saturday for the first seven hours of work and double time shall be paid for all work on a Saturday thereafter.

**Overtime**

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

For off shift work - 8 hours pay for 7 hours of work. When two or three shifts are employed on a job, Monday through Friday, the workday for each shift shall be seven hours and paid for ten and one-half hours at the single

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

time rate. When two or three shifts are worked on Saturday, Sunday or holidays, each shift shall be seven hours and paid fifteen and three-quarters hours.

(Local #580)

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## IRON WORKER - STRUCTURAL

### Iron Worker - Structural

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$45.05

Supplemental Benefit Rate per Hour: \$57.85

Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

### Overtime Description

Monday through Friday- the first eight hours are paid at straight time, the 9th and 10th hours are paid at time and one-half the regular rate, all additional weekday overtime is paid at double the regular rate. Saturdays- the first eight hours are paid at time and one-half the regular rate, double time thereafter. Sunday-all shifts are paid at double time.

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

### Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

1/2 day on New Year's Eve if work is performed in the A.M.

### Shift Rates

Monday through Friday - First Shift: First eight hours are paid at straight time, the 9th & 10th hours are paid at time and a half, double time paid thereafter. Second and third Shifts: First eight hours are paid at time and one-half, double time thereafter. Saturdays: All shifts, first eight hours paid at time and one-half, double time thereafter. Sunday all shifts are paid at double time.

(Local #40 & #361)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

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## **LABORER**

**(Foundation, Concrete, Excavating, Street Pipe Layer and Common)**

### **Laborer**

Excavation and foundation work for buildings, heavy construction, engineering work, and hazardous waste removal in connection with the above work. Landscaping tasks in connection with heavy construction work, engineering work and building projects. Projects include, but are not limited to pollution plants, sewers, parks, subways, bridges, highways, etc.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$38.70**

Supplemental Benefit Rate per Hour: **\$31.75**

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

Labor Day

Thanksgiving Day

### **Shift Rates**

When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

**LANDSCAPING**

Landscaping tasks, as well as tree pruning, tree removing, spraying and maintenance in connection with the planting of street trees and the planting of trees in city parks but not when such activities are performed as part of, or in connection with, other construction or reconstruction projects.)

**Landscaper (Above 6 years experience)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$24.25

Supplemental Benefit Rate per Hour: \$12.30

**Landscaper (3 - 6 years experience)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$23.25

Supplemental Benefit Rate per Hour: \$12.30

**Landscaper (up to 3 years experience)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.75

Supplemental Benefit Rate per Hour: \$12.30

**Groundperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.75

Supplemental Benefit Rate per Hour: \$12.30

**Tree Remover / Pruner**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$29.25

Supplemental Benefit Rate per Hour: \$12.30

**Landscaper Sprayer (Pesticide Applicator)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$19.25

Supplemental Benefit Rate per Hour: \$12.30

**Watering – Plant Maintainer**

Effective Period: 7/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Wage Rate per Hour: **\$14.25**

Supplemental Benefit Rate per Hour: **\$12.30**

### **Overtime Description**

For all overtime work performed, supplemental benefits shall include an additional seventy-five (\$0.75) cents per hour.

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on a holiday plus the day's pay.

### **Paid Holidays**

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

### **Shift Rates**

Work performed on a 4pm to 12am shift has a 15% differential. Work performed on a 12am to 8am shift has a 20% differential.

(Local #175)

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## **MARBLE MECHANIC**

### **Marble Setter**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$49.19**

Supplemental Benefit Rate per Hour: **\$32.24**

### **Marble Finisher**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$39.05**

Supplemental Benefit Rate per Hour: **\$31.43**

### **Marble Polisher**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$34.73**

Supplemental Benefit Rate per Hour: **\$24.60**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

### **Overtime Description**

Supplemental Benefit contributions are to be made at the applicable overtime rates. Time and one half the regular rate after a 7 hour day or time and one half the regular rate after an 8 hour day - chosen by Employer at the start of the project and then would last for the full duration of the project.

### **Overtime**

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

### **Paid Holidays**

None

(Local #7)

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## **MASON TENDER**

### **Mason Tender**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$34.24**

Supplemental Benefit Rate per Hour: **\$24.40**

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

The Employer may work two (2) shifts with the first shift at the straight time wage rate and the second shift receiving eight (8) hours paid for seven (7) hours work at the straight time wage rate.

(Local #79)

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**MASON TENDER (INTERIOR DEMOLITION WORKER)**

(The erection, building, moving, servicing and dismantling of enclosures, scaffolding, barricades, protection and site safety structures etc., on Interior Demolition jobs.)

**Mason Tender Tier A**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$33.87**

Supplemental Benefit Rate per Hour: **\$19.22**

**Mason Tender Tier B**

On Interior Demolition job sites 33 1/3 % of the employees shall be classified as Tier A Interior Demolition Workers and 66 2/3 % shall be classified as Tier B Interior Demolition Workers; provided that the employer may employ more than 33 1/3 % Tier A Interior Demolition Workers on the job site. Where the number of employees on a job site is not divisible by 3, the first additional employee (above the number of employees divisible by three) shall be a Tier B Interior Demolition Worker, and the second additional employee shall be a Tier A Interior Demolition Worker.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$23.07**

Supplemental Benefit Rate per Hour: **\$13.53**

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

President's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

(Local #79)

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**METALLIC LATHER**

**Metallic Lather**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$41.23

Supplemental Benefit Rate per Hour: \$38.35

Supplemental Note: Supplemental benefits for overtime are paid at the appropriate overtime rate.

**Overtime Description**

Overtime would be time and one half the regular rate after a seven (7) or eight (8) hours workday, which would be set at the start of the job.

**Overtime**

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
Washington's Birthday  
Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

1/2 day on Christmas Eve if work is performed in the A.M.

1/2 day on New Year's Eve if work is performed in the A.M.

**Shift Rates**



**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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There shall be either two (2) or three (3) shifts, each shift shall be eight (8) hours with nine (9) hours pay, including one half (½) hour for lunch. Off-Hour Start shall commence after 3:30 P.M. and shall conclude by 6:00 A.M. The first consecutive seven (7) hours shall be at straight time with a differential of twelve dollars (\$12.00) per hour. Fringes shall be paid at the straight time rate.

(Local #46)

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## **MILLWRIGHT**

### **Millwright**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$46.19**

Supplemental Benefit Rate per Hour: **\$45.67**

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

1/2 day on Christmas Eve if work is performed in the A.M.

1/2 day on New Year's Eve if work is performed in the A.M.

### **Shift Rates**

The first shift shall receive the straight time rate of pay. The second shift receives the straight time rate of pay plus fifteen (15%) per cent. Members of the second shift shall be allowed one half hour to eat, with this time being included in the hours of the workday established. There must be a first shift to work a second shift. All additional hours worked shall be paid at the time and one-half rate of pay plus fifteen (15%) per cent for weekday hours.

(Local #740)

## **MOSAIC MECHANIC**

### **Mosaic Mechanic - Mosaic & Terrazzo Mechanic**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$43.93**

Supplemental Benefit Rate per Hour: **\$33.08**

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$44.05 per hour.

### **Mosaic Mechanic - Mosaic & Terrazzo Finisher**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$42.36**

Supplemental Benefit Rate per Hour: **\$33.08**

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$44.05 per hour.

### **Mosaic Mechanic - Machine Operator Grinder**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$42.36**

Supplemental Benefit Rate per Hour: **\$33.08**

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$44.05 per hour.

## **Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

## **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

## **Paid Holidays**

None

(Local #7)

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## **PAINTER**

### **Painter - Brush & Roller**

**Effective Period: 7/1/2012 – 10/31/2012**

**Wage Rate per Hour: \$35.50**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

**Effective Period: 11/1/2012 - 4/30/2013**

**Wage Rate per Hour: \$36.00**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

**Effective Period: 5/1/2013 - 6/30/2013**

**Wage Rate per Hour: \$37.50**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

### **Spray & Scaffold / Decorative / Sandblast**

**Effective Period: 7/1/2012 – 10/31/2012**

**Wage Rate per Hour: \$38.50**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

**Effective Period: 11/1/2012 - 4/30/2013**

**Wage Rate per Hour: \$39.00**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

**Effective Period: 5/1/2013 - 6/30/2013**

**Wage Rate per Hour: \$40.50**

**Supplemental Benefit Rate per Hour: \$25.12**

**Supplemental Note: \$29.75 on overtime**

### **Overtime**

**Time and one half the regular rate after a 7 hour day.**

**Time and one half the regular rate for Saturday.**

**Time and one half the regular rate for Sunday.**

### **Overtime Holidays**

**Time and one half the regular rate for work on the following holiday(s).**

**New Year's Day**

**President's Day**

**Memorial Day**

**Independence Day**

**Labor Day**

**Columbus Day**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Thanksgiving Day  
Christmas Day

**Paid Holidays**  
None

(District Council of Painters #9)

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**PAINTER - SIGN**

**Designer**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$36.15  
Supplemental Benefit Rate per Hour: \$9.66

**Journey person**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$33.62  
Supplemental Benefit Rate per Hour: \$9.66

**Overtime**

Time and one half the regular rate after an 8 hour day.  
Time and one half the regular rate for Saturday.  
Time and one half the regular rate for Sunday.  
Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Election Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Shift Rates**

All work performed outside the regular 8 hour work day (either 7:00 A.M to 3:30 P.M or 8:00 A.M. to 4:30 P.M)  
shall be paid at time and one half the regular hourly rate.

(Local #8A-28A)

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## **PAINTER - STRIPER**

### **Striper (paint)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$31.00**

Supplemental Benefit Rate per Hour: **\$10.56**

Supplemental Note: Overtime Supplemental Benefit rate - \$6.46

### **Lineperson (thermoplastic)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$35.00**

Supplemental Benefit Rate per Hour: **\$10.56**

Supplemental Note: Overtime Supplemental Benefit rate - \$6.46

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on the following holiday(s).

### **Paid Holidays**

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

### **Shift Rates**

15% night shift premium differential for all work performed after 9:00 P.M.

### **Vacation**

Employees with one to three years service shall accrue vacation based on hours worked: 250 hours worked - 1 day vacation; 500 hours worked - 2 days vacation; 750 hours worked - 3 days vacation; 900 hours worked - 4 days vacation; 1,000 hours worked - 5 days vacation. Employees with three to ten years service receive two weeks vacation. Employees with ten or more years service receive three weeks vacation. Vacation must be taken during winter months.

(Local #917)

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## **PAINTER - STRUCTURAL STEEL**

### **Painters on Structural Steel**

Effective Period: 7/1/2012 - 9/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$46.25

Supplemental Benefit Rate per Hour: \$31.58

Effective Period: 10/1/2012 - 6/30/2013

Wage Rate per Hour: \$47.00

Supplemental Benefit Rate per Hour: \$32.08

**Painter - Power Tool**

Effective Period: 7/1/2012 - 9/30/2013

Wage Rate per Hour: \$52.25

Supplemental Benefit Rate per Hour: \$31.58

Effective Period: 10/1/2012 - 6/30/2013

Wage Rate per Hour: \$53.00

Supplemental Benefit Rate per Hour: \$32.08

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

None

**Shift Rates**

Regular hourly rates plus a ten per cent (10%) differential

(Local #806)

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**PAPERHANGER**

**Paperhanger**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.44

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: **\$29.23**

Supplemental Note: Supplemental benefits are to be paid at the appropriate straight time and overtime rate.

### Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

### Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

### Paid Holidays

None

### Shift Rates

Evening shift - 4:30 P.M. to 12:00 Midnight (regular rate of pay); any work performed before 7:00 A.M. shall be at time and one half the regular base rate of pay.

(District Council of Painters #9)

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## PAVER AND ROADBUILDER

### Paver & Roadbuilder - Formsetter

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$42.86**

Supplemental Benefit Rate per Hour: **\$32.15**

### Paver & Roadbuilder - Laborer

Paving and road construction work, regardless of material used, including but not limited to preparation of job sites, removal of old surfaces, asphalt and/or concrete, by whatever method, including but not limited to milling; laying of concrete; laying of asphalt for temporary, patchwork, and utility paving (but not production paving); site preparation and incidental work before the installation of rubberized materials and similar surfaces; installation and repair of temporary construction fencing; slurry seal coating, maintenance of safety surfaces; play equipment installation, and other related work.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$38.99**

Supplemental Benefit Rate per Hour: **\$32.15**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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**Production Paver & Roadbuilder - Screed Person**

(Production paving is asphalt paving when using a paving machine or on a project where a paving machine is traditionally used)

Adjustment of paving machinery on production paving jobs.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$45.00

Supplemental Benefit Rate per Hour: \$32.15

**Production Paver & Roadbuilder - Raker**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$44.49

Supplemental Benefit Rate per Hour: \$32.15

**Production Paver & Roadbuilder - Shoveler**

General laborer (except removal of surfaces - see Paver and Roadbuilder-Laborer) including but not limited to tamper, AC paint and liquid tar work.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$41.20

Supplemental Benefit Rate per Hour: \$32.15

**Overtime Description**

Veteran's Day is a Paid Holiday for employees working on production paving.

If an employee works New Year's Day or Christmas Day, they receive the single time rate plus 15%, except if an employee works on production paving on New Year's Day or Christmas Day, they receive the single time rate plus one day's pay for the holiday worked.

Employees who work on a holiday listed below receive the straight time rate plus one day's pay for the holiday.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Paid Holidays**

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Thanksgiving Day

**ift Rates**



**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE**

When two shifts are employed, the work period for each shift shall be a continuous eight (8) hours. When three shifts are employed, each shift will work seven and one half (7 ½) hours but will be paid for eight (8) hours since only one half (1/2) hour is allowed for meal time.

When two or more shifts are employed, single time will be paid for each shift.

**Night Work** - On night work, the first eight (8) hours of work will be paid for at fifteen percent (15%) over the single time rate, except that production paving work shall be paid at 25% over the single time rate. Hours worked over eight (8) hours during said shift shall be paid for at the time and one-half rate.

(Local #1010)

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## **PLASTERER**

### **Plasterer**

**Effective Period:** 7/1/2012 - 6/30/2013

**Wage Rate per Hour:** \$40.78

**Supplemental Benefit Rate per Hour:** \$26.80

### **Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

None

### **Shift Rates**

When it is not possible to conduct alteration work during regular work hours, in a building occupied by tenants, said work shall proceed on a shift basis: however work over seven (7) hours in any twenty four (24) hour period, the time after seven (7) hours shall be considered overtime.

The second shift shall start at a time between 3:30 p.m. and 7:00 p.m. and shall consist of seven (7) working hours and shall receive eight (8) hours of wages and benefits at the straight time rate. The workers on the

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

second shift shall be allowed one-half (½) hour to eat with this time being included in the seven (7) hours of work.

(Local #530)

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## **PLASTERER - TENDER**

### **Plasterer - Tender**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$34.24

Supplemental Benefit Rate per Hour: \$24.40

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Presidential Election Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

None

### **Shift Rates**

When work commences outside regular work hours, workers receive an hour additional (differential) wage and supplement payment. Eight hours pay for seven hours work or nine hours pay for eight hours work.

(Mason Tenders District Council)

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## **PLUMBER**

### **Plumber**

Effective Period: 7/1/2012 - 6/30/2013

**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE**

**Wage Rate per Hour: \$51.76**

**Supplemental Benefit Rate per Hour: \$37.19**

**Supplemental Note: Overtime supplemental benefit rate per hour: \$74.10**

**Overtime Description**

Double time the regular rate after a 7 hour day - unless for new construction site work where the plumbing contract price is \$1 million or less, and for public works jobs where the plumbing contract is \$1.5 million or less, the hours of labor can be 8 hours per day at the employers option. On Alteration jobs when other mechanical trades at the site are working an eighth hour at straight time, then the plumber shall also work an eighth hour at straight time.

**Overtime**

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Shift Rates**

Shift work, when directly specified in public agency or authority documents where plumbing contract is \$8 million or less, will be permitted. 30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday. 50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

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**PLUMBER (MECHANICAL EQUIPMENT AND SERVICE)**

**(Mechanical Equipment and Service work shall include any repair and/or replacement of the present plumbing system.)**

**Effective Period: 7/1/2012 - 6/30/2013**

**Wage Rate per Hour: \$32.96**

**Supplemental Benefit Rate per Hour: \$15.93**

**Overtime**

Time and one half the regular rate after an 8 hour day.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Time and one half the regular rate for Saturday.  
Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Paid Holidays**

None

(Plumbers Local # 1)

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**PLUMBER (RESIDENTIAL RATES FOR 1, 2 AND 3 FAMILY HOME  
CONSTRUCTION)**

Effective Period: 7/1/2012 - 6/30/2013

Base Rate per Hour: \$36.69

Supplemental Benefit Rate per Hour: \$25.46

**Overtime**

Double time the regular rate after an 8 hour day.  
Double time the regular time rate for Saturday.  
Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday.  
50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

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**PLUMBER: PUMP & TANK**  
**(Installation and Maintenance)**

**Plumber - Pump & Tank**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$52.31

Supplemental Benefit Rate per Hour: \$31.56

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Paid Holidays**

None

**Shift Rates**

All work outside the regular workday (8:00 A.M. to 3:30 P.M.) is to be paid at time and one half the regular hourly rate

(Plumbers Local #1)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**POINTER - WATERPROOFER, CAULKER MECHANIC (EXTERIOR BUILDING  
RENOVATION)**

**Pointer - Waterproofer, Caulker Mechanic**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$44.63**

Supplemental Benefit Rate per Hour: **\$23.10**

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

None

**Shift Rates**

All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:30 P.M.) is to be paid at time and one half the regular rate.

(Bricklayer District Council)

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**ROOFER**

**Roofer**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$38.00**

Supplemental Benefit Rate per Hour: **\$27.07**

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Presidential Election Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

Second shift - Regular hourly rate plus a 10% differential. Third shift - Regular hourly rate plus a 15% differential.

(Local #8)

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**SANDBLASTER - STEAMBLASTER**  
**(Exterior Building Renovation)**

**Sandblaster / Steamblaster**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$44.63

Supplemental Benefit Rate per Hour: \$23.10

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day  
Martin Luther King Jr. Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**Paid Holidays**

None

**Shift Rates**

All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:30 P.M.) is to be paid at time and one half the regular rate.

(Bricklayer District Council)

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**SHEET METAL WORKER**

**Sheet Metal Worker**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$45.65

Supplemental Benefit Rate per Hour: \$40.50

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

**Sheet Metal Worker - Duct Cleaner**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$12.90

Supplemental Benefit Rate per Hour: \$8.07

**Sheet Metal Worker - Fan Maintenance**

(The temporary operation of fans or blowers in new or existing buildings for heating and/or ventilation, and/or air conditioning prior to the completion of the project.)

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.52

Supplemental Benefit Rate per Hour: \$40.50

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

### **Paid Holidays**

None

### **Shift Rates**

Work that can only be performed outside regular working hours (seven hours of work between 7:30 A.M. and 3:30 P.M.) - First shift (work between 3:30 P.M. and 11:30 P.M.) - 10% differential above the established hourly rate.  
Second shift (work between 11:30 P.M. and 7:30 A.M.) - 15% differential above the established hourly rate.

For Fan Maintenance: On all full shifts of fan maintenance work the straight time hourly rate of pay will be paid for each shift, including nights, Saturdays, Sundays, and holidays. No journeyman engaged in fan maintenance shall work in excess of forty (40) hours in any work week.

(Local #28)

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## **SHEET METAL WORKER - SPECIALTY (Decking & Siding)**

### **Sheet Metal Specialty Worker**

The first worker to perform this work must be paid at the rate of the Sheet Metal Worker. The second and third workers shall be paid the Specialty Worker Rate. The ratio of One Sheet Metal Worker, then Two Specialty Workers shall be utilized thereafter.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$40.09

Supplemental Benefit Rate per Hour: \$22.06

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
Martin Luther King Jr. Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

None

(Local #28)

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**SIGN ERECTOR**

(Sheet Metal, Plastic, Electric, and Neon)

**Sign Erector**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$41.55

Supplemental Benefit Rate per Hour: \$39.32

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Time and one half the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day  
Washington's Birthday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Election Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Shift Rates**

Time and one half the regular hourly rate is to be paid for all hours worked outside the regular workday either (7:00 A.M. through 2:30 P.M.) or (8:00 A.M. through 3:30 P.M.)

(Local #137)

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

## STEAMFITTER

### Steamfitter I

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.75

Supplemental Benefit Rate per Hour: \$49.68

Supplemental Note: Overtime supplemental benefit rate: \$98.62

### Overtime

Double time the regular rate after a 7 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

### Paid Holidays

None

### Shift Rates

Work performed between 3:30 P.M. and 7:00 A.M. and on Saturdays, Sundays and Holidays shall be at double time the regular hourly rate and paid at the overtime supplemental benefit rate above.

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### Steamfitter II

For heating, ventilation, air conditioning and mechanical public works contracts with a dollar value not to exceed \$15,000,000 and for fire protection/sprinkler public works contracts not to exceed \$1,500,000.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.75

Supplemental Benefit Rate per Hour: \$49.68

Supplemental Note: Overtime supplemental benefit rate: \$98.62

### Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

**Paid Holidays**

None

**Shift Rates**

May be performed outside of the regular workday except Saturday, Sunday and Holidays. A shift shall consist of eight working hours. All work performed in excess of eight hours shall be paid at double time. No shift shall commence after 7:00 P.M. on Friday or 7:00 P.M. the day before holidays. All work performed after 12:01 A.M. Saturday or 12:01 A.M. the day before a Holiday will be paid at double time. When shift work is performed the wage rate for regular time worked is a thirty percent premium together with fringe benefits.

On Transit Authority projects, where work is performed in the vicinity of tracks all shift work on weekends and holidays may be performed at the regular shift rates.

Local #638

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**STEAMFITTER - REFRIGERATION AND AIR CONDITIONER  
(Maintenance and Installation Service Person)**

**Refrigeration and Air Conditioner Mechanic**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.30

Supplemental Benefit Rate per Hour: \$11.76

**Refrigeration and Air Conditioner Service Person V (4th year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$29.82

Supplemental Benefit Rate per Hour: \$10.71

**Refrigeration and Air Conditioner Service Person IV (3rd year)**

Effective Period: 7/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$24.71

Supplemental Benefit Rate per Hour: \$9.80

**Refrigeration and Air Conditioner Service Person III (2nd year)**

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.21

Supplemental Benefit Rate per Hour: \$9.12

**Refrigeration and Air Conditioner Service Person II (2nd six months)**

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.60

Supplemental Benefit Rate per Hour: \$8.50

**Refrigeration and Air Conditioner Service Person I (1st six months)**

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2012 6/30/2013

Wage Rate per Hour: \$10.95

Supplemental Benefit Rate per Hour: \$7.90

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

Independence Day

Labor Day

Veteran's Day

Thanksgiving Day

Christmas Day

Double time and one half the regular rate for work on the following holiday(s).

Martin Luther King Jr. Day

President's Day

Memorial Day

Columbus Day

**Paid Holidays**

New Year's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Martin Luther King Jr. Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

(Local #638B)

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## STONE MASON - SETTER

### Stone Mason - Setters

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$47.72

Supplemental Benefit Rate per Hour: \$35.28

### Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

### Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

### Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

### Shift Rates

For all work outside the regular workday (8:00 A.M. to 3:30 P.M. Monday through Friday), the pay shall be straight time plus a ten percent (10%) differential.

(Bricklayers District Council)

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

## **TAPER**

### **Drywall Taper**

Effective Period: 7/1/2012 – 12/25/2012

Wage Rate per Hour: **\$43.32**

Supplemental Benefit Rate per Hour: **\$21.66**

Effective Period: 12/26/2012 - 6/30/2013

Wage Rate per Hour: **\$43.82**

Supplemental Benefit Rate per Hour: **\$21.66**

### **Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

### **Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Thanksgiving Day

Christmas Day

### **Paid Holidays**

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

### **Shift Rates**

Time and one half the regular rate outside the regular work hours (8:00 A.M. through 3:30 P.M.)

(Local #1974)

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## **TELECOMMUNICATION WORKER (Voice Installation Only)**

### **Telecommunication Worker**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$35.94**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

**Supplemental Benefit Rate per Hour: \$13.19**

**Supplemental Note:** The above rate applies for Manhattan, Bronx, Brooklyn, Queens. \$12.64 for Staten Island only.

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

**Overtime Holidays**

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Lincoln's Birthday

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

**Paid Holidays**

New Year's Day

Lincoln's Birthday

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees have the option of observing either Martin Luther King's Birthday or the day after Thanksgiving instead of Lincoln's Birthday

**Shift Rates**

For any workday that starts before 8A.M. or ends after 6P.M. there is a 10% differential for the applicable worker's hourly rate.

**Vacation**

After 6 months.....one week.

After 12 months but less than 7 years.....two weeks.

After 7 or more but less than 15 years.....three weeks.

After 15 years or more but less than 25 years.....four weeks.

(C.W.A.)



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

**TILE FINISHER**

**Tile Finisher**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$38.17**

Supplemental Benefit Rate per Hour: **\$26.76**

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Paid Holidays**

None

**Shift Rates**

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

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**TILE LAYER - SETTER**

**Tile Layer - Setter**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$47.75**

Supplemental Benefit Rate per Hour: **\$30.83**

**Overtime**

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

Double time the regular rate for Sunday.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Veteran's Day  
Thanksgiving Day  
Day after Thanksgiving  
Christmas Day

### **Shift Rates**

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

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## **TIMBERPERSON**

### **Timberperson**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$42.63

Supplemental Benefit Rate per Hour: \$41.99

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

### **Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

New Year's Day  
President's Day  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Presidential Election Day  
Thanksgiving Day  
Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

**Paid Holidays**

None

**Shift Rates**

Off shift work, commencing between 5:00 P.M. and 10:00 P.M., shall work eight and one half hours but will be paid for 9 hours, including benefits at the straight time rate for 8 hours.

(Local #1536)

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**TUNNEL WORKER**

**Blasters, Mucking Machine Operators (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$52.00

Supplemental Benefit Rate per Hour: \$46.85

**Tunnel Workers (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$50.19

Supplemental Benefit Rate per Hour: \$45.29

**Top Nipper (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$49.27

Supplemental Benefit Rate per Hour: \$44.51

**Outside Lock Tender, Outside Gauge Tender, Muck Lock Tender (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$48.37

Supplemental Benefit Rate per Hour: \$43.67

**Bottom Bell & Top Bell Signal Person: Shaft Person (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$48.37

Supplemental Benefit Rate per Hour: \$43.67

**Changehouse Attendant: Powder Watchperson (Compressed Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$42.09

Supplemental Benefit Rate per Hour: \$41.41

**Blasters (Free Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$49.62

Supplemental Benefit Rate per Hour: \$44.75

**Tunnel Workers (Free Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$47.48

Supplemental Benefit Rate per Hour: \$42.84

**All Others (Free Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$43.87

Supplemental Benefit Rate per Hour: \$39.62

**Microtunneling (Free Air Rates)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.98

Supplemental Benefit Rate per Hour: \$34.27

**Overtime Description**

For Repair-Maintenance Work on Existing Equipment and Facilities - Time and one half the regular rate after a 7 hour day, or for Saturday, or for Sunday. Double time the regular rate for work on a holiday.

**Overtime**

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 PREVAILING WAGE SCHEDULE

(Local #147)

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**WELDER**  
**TO BE PAID AT THE RATE OF THE JOURNEYPERSON IN THE TRADE**  
**PERFORMING THE WORK.**

**OFFICE OF THE COMPTROLLER**

**CITY OF NEW YORK**

**220 APPRENTICESHIP PREVAILING WAGE SCHEDULE**

**APPENDIX**

Pursuant to Labor Law §220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant and registered with the New York State Department of Labor, may be employed on a public work project.

Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the journey person wage rate for the classification of work he actually performed.

Apprentice ratios are established to ensure the proper safety, training and supervision of apprentices. A ratio establishes the number of journey workers required for each apprentice in a program and on a job site. Ratios are interpreted as follows: in the case of a 1:1, 1:4 ratio, there must be one journey worker for the first apprentice, and four additional journey workers for each subsequent apprentice.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**ASBESTOS HANDLER**

(Ratio of Apprentice Journeyperson: 1 to 1, 1 to 3)

**Asbestos Handler (First 1000 Hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 78% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$14.85

**Asbestos Handler (Second 1000 Hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$14.85

**Asbestos Handler (Third 1000 Hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 83% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$14.85

**Asbestos Handler (Fourth 1000 Hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 89% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$14.85

(Local #78)

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**BOILERMAKER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Boilermaker (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 65% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$27.41

**Boilermaker (Second Year: 1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 70% of Journeyperson's rate

Supplemental Benefit Rate Per Hour: \$28.91

**Boilermaker (Second Year: 2nd Six Months)**



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 75% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$30.40

**Boilermaker (Third Year: 1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$31.89

**Boilermaker (Third Year: 2nd Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 85% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$33.38

**Boilermaker (Fourth Year: 1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 90% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$34.88

**Boilermaker (Fourth Year: 2nd Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 95% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$36.38

(Local #5)

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**BRICKLAYER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Bricklayer (First 750 Hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$16.60

**Bricklayer (Second 750 Hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 60% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$16.60

**Bricklayer (Third 750 Hours)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 70% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$16.60

**Bricklayer (Fourth 750 Hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$16.60

**Bricklayer (Fifth 750 Hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 90% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$16.60

**Bricklayer (Sixth 750 Hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 95% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$16.60

(Bricklayer District Council)

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**CARPENTER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

**Carpenter (First Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 40% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Carpenter (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Carpenter (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyman's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Carpenter (Fourth Year)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$27.69

(Carpenters District Council)

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**CEMENT MASON**  
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Cement Mason (First Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's Rate

**Cement Mason (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's Rate

**Cement Mason (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 70% of Journeyperson's Rate

(Local #780)

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**CEMENT AND CONCRETE WORKER**  
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Cement & Concrete Worker (0 - 500 hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$17.54

**Cement & Concrete Worker (501 - 1000 hours)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$18.37

**Cement & Concrete Worker (1001 - 2000 hours)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 65% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$23.75

**Cement & Concrete Worker (2001 - 4000 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$24.57

(Cement Concrete Workers District Council)

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**DERRICKPERSON & RIGGER (STONE)**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 6)

**Derrickperson & Rigger (stone) - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Benefit Rate Per Hour: 50% of Journeyman's rate

**Derrickperson & Rigger (stone) - Second Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 70% of Journeyman's rate

Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

**Derrickperson & Rigger (stone) - Second Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyman's rate

Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

**Derrickperson & Rigger (stone) - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 90% of Journeyman's rate

Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

(Local #197)

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**DOCKBUILDER/PILE DRIVER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 6)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Dockbuilder/Pile Driver (First Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 40% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Dockbuilder/Pile Driver (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Dockbuilder/Pile Driver (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$27.69

**Dockbuilder/Pile Driver (Fourth Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyperson's rate  
Supplemental Benefit Rate Per Hour: \$27.69

(Carpenters District Council)

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**ELECTRICIAN**

**(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)**

**Electrician (First Year - Hired before 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$14.25  
Supplemental Benefit Rate per Hour: \$11.19  
Overtime Wage Rate Per Hour: \$21.38  
Overtime Supplemental Rate Per Hour: \$11.96

**Electrician (First Year - Hired on or After 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$11.50  
Supplemental Benefit Rate per Hour: \$9.86  
Overtime Wage Rate Per Hour: \$17.25  
Overtime Supplemental Rate Per Hour: \$10.48

**Electrician (Second Year - Hired before 5/10/07)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.05

Supplemental Benefit Rate per Hour: \$12.54

Overtime Wage Rate Per Hour: \$25.58

Overtime Supplemental Rate Per Hour: \$13.47

**Electrician (Second Year - Hired on or After 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$13.50

Supplemental Benefit Rate per Hour: \$10.83

Overtime Wage Rate Per Hour: \$20.25

Overtime Supplemental Rate Per Hour: \$11.56

**Electrician (Third Year - Hired before 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$19.15

Supplemental Benefit Rate per Hour: \$13.56

Overtime Wage Rate Per Hour: \$28.73

Overtime Supplemental Rate Per Hour: \$14.60

**Electrician (Third Year - Hired on or After 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$15.50

Supplemental Benefit Rate per Hour: \$11.79

Overtime Wage Rate Per Hour: \$23.25

Overtime Supplemental Rate Per Hour: \$12.63

**Electrician (Fourth Year - Hired before 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.10

Supplemental Benefit Rate per Hour: \$14.50

Overtime Wage Rate Per Hour: \$31.65

Overtime Supplemental Rate Per Hour: \$15.65

**Electrician (Fourth Year - Hired on or After 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.50

Supplemental Benefit Rate per Hour: \$12.76

Overtime Wage Rate Per Hour: \$26.25

Overtime Supplemental Rate Per Hour: \$13.71

**Electrician (Fifth Year - Hired before 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.30

Supplemental Benefit Rate per Hour: \$17.52

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Overtime Wage Rate Per Hour: \$37.95  
Overtime Supplemental Rate Per Hour: \$18.85

**Electrician (Fifth Year - Hired on or After 5/10/07)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$21.50  
Supplemental Benefit Rate per Hour: \$15.71  
Overtime Wage Rate Per Hour: \$32.25  
Overtime Supplemental Rate Per Hour: \$16.84

**Overtime Description**

For "A" rated Apprentices (work in excess of 7 hours per day)  
For "M" rated Apprentices (work in excess of 8 hours per day)

(Local #3)

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**ELEVATOR CONSTRUCTOR**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

**Elevator (Constructor) - First Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Rate Per Hour: \$25.40  
Effective 3/17/2013 - Supplemental Benefit Per Hour: \$26.87

**Elevator (Constructor) - Second Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 55% of Journeyperson's rate  
Supplemental Rate Per Hour: \$26.43  
Effective 3/17/2013 - Supplemental Benefit Per Hour: \$27.92

**Elevator (Constructor) - Third Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyperson's rate  
Supplemental Rate Per Hour: \$27.84  
Effective 3/17/2013 - Supplemental Benefit Per Hour: \$29.38

**Elevator (Constructor) - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 75% of Journeyperson's rate  
Supplemental Rate Per Hour: \$29.25  
Effective 3/17/2013 - Supplemental Benefit Per Hour: \$30.84

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Local #1)

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**ELEVATOR REPAIR & MAINTENANCE**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 2)

**Elevator Service/Modernization Mechanic (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Rate Per Hour: \$25.33

Effective 3/17/2013 - Supplemental Benefit Per Hour: \$26.79

**Elevator Service/Modernization Mechanic (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 55% of Journeyman's rate

Supplemental Rate Per Hour: \$25.65

Effective 3/17/2013 - Supplemental Benefit Per Hour: \$27.12

**Elevator Service/Modernization Mechanic (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 65% of Journeyman's rate

Supplemental Rate Per Hour: \$26.92

Effective 3/17/2013 - Supplemental Benefit Per Hour: \$28.43

**Elevator Service/Modernization Mechanic (Fourth Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 75% of Journeyman's rate

Supplemental Rate Per Hour: \$28.19

Effective 3/17/2013 - Supplemental Benefit Per Hour: \$29.74

(Local #1)

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**ENGINEER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 5)

**Engineer - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.64

Supplemental Benefit Rate per Hour: \$20.07



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Engineer - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.05

Supplemental Benefit Rate per Hour: \$20.07

**Engineer - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$29.75

Supplemental Benefit Rate per Hour: \$20.07

**Engineer - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$32.45

Supplemental Benefit Rate per Hour: \$20.07

(Local #15)

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**ENGINEER - OPERATING**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 5)

**Operating Engineer - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour 40% of Journeyperson's Rate

Supplemental Benefit Per Hour: \$18.65

**Operating Engineer - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyperson's Rate

Supplemental Benefit Per Hour: \$18.65

**Operating Engineer - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 60% of Journeyperson's Rate

Supplemental Benefit Per Hour: \$18.65

(Local #14)

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## **FLOOR COVERER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

### **Floor Coverer (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 40% of Journeyman's rate

Supplemental Rate Per Hour: \$25.75

### **Floor Coverer (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Rate Per Hour: \$25.75

### **Floor Coverer (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 65% of Journeyman's rate

Supplemental Rate Per Hour: \$25.75

### **Floor Coverer (Fourth Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyman's rate

Supplemental Rate Per Hour: \$25.75

(Carpenters District Council)

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## **GLAZIER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

### **Glazier (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 40% of Journeyman's rate

Supplemental Rate Per Hour: \$11.97

### **Glazier (Second Year)**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Rate Per Hour: \$21.01

Effective Period: 11/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Rate Per Hour: \$21.13

**Glazier (Third Year)**

Effective Period: 7/1/2012 - 10/31/2012  
Wage Rate Per Hour: 60% of Journeyperson's rate  
Supplemental Rate Per Hour: \$23.38

Effective Period: 11/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Rate Per Hour: \$23.54

**Glazier (Fourth Year)**

Effective Period: 7/1/2012 - 10/31/2012  
Wage Rate Per Hour: 80% of Journeyperson's rate  
Supplemental Rate Per Hour: \$28.14

Effective Period: 11/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Rate Per Hour: \$28.34

(Local #1281)

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**HEAT & FROST INSULATOR**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Heat & Frost Insulator (First Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

**Heat & Frost Insulator (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

**Heat & Frost Insulator (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 70% of Journeyperson's rate

**Heat & Frost Insulator (Fourth Year)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Local #12)

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**HOUSE WRECKER  
(TOTAL DEMOLITION)  
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)**

**House Wrecker - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.06

Supplemental Benefit Rate per Hour: \$15.45

**House Wrecker - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.06

Supplemental Benefit Rate per Hour: \$15.45

**House Wrecker - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$22.56

Supplemental Benefit Rate per Hour: \$15.45

**House Wrecker - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.06

Supplemental Benefit Rate per Hour: \$15.45

(Local #79)

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**IRON WORKER - ORNAMENTAL  
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)**

**Iron Worker (Ornamental) - 1st Four Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 60% of Journeyperson's rate

Supplemental Rate Per Hour: \$32.06

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Iron Worker (Ornamental) 5 - 10 Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyman's rate  
Supplemental Rate Per Hour: \$32.89

**Iron Worker (Ornamental) 11 - 16 Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 70% of Journeyman's rate  
Supplemental Rate Per Hour: \$33.73

**Iron Worker (Ornamental) 17 - 22 Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyman's rate  
Supplemental Rate Per Hour: \$35.39

**Iron Worker (Ornamental) 23 - 28 Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 85% of Journeyman's rate  
Supplemental Rate Per Hour: \$36.22

**Iron Worker (Ornamental) 29 - 36 Months - Hired on or Before 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 95% of Journeyman's rate  
Supplemental Rate Per Hour: \$37.89

**Iron Worker (Ornamental) - 1st Ten Months - Hired After 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyman's rate  
Supplemental Rate Per Hour: \$30.40

**Iron Worker (Ornamental) - 11 - 16 Months - Hired After 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 55% of Journeyman's rate  
Supplemental Rate Per Hour: \$31.23

**Iron Worker (Ornamental) - 17 - 22 Months - Hired After 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 60% of Journeyman's rate  
Supplemental Rate Per Hour: \$32.06

**Iron Worker (Ornamental) - 23 - 28 Months - Hired After 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 70% of Journeyman's rate

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Supplemental Rate Per Hour: \$33.73

**Iron Worker (Ornamental) - 29 - 36 Months - Hired After 8/1/08**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyperson's rate

Supplemental Rate Per Hour: \$35.39

(Local #580)

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**IRON WORKER - STRUCTURAL**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

**Iron Worker (Structural) - 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$23.62

Supplemental Benefit Rate per Hour: \$41.21

**Iron Worker (Structural) - 7- 18 Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$24.22

Supplemental Benefit Rate per Hour: \$41.21

**Iron Worker (Structural) - 19 - 36 months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$24.82

Supplemental Benefit Rate per Hour: \$41.21

(Local #40 and #361)

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**LABORER (FOUNDATION, CONCRETE, EXCAVATING, STREET PIPE LAYER & COMMON)**

(Ratio Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - First 1000 hours**

Effective Period: 7/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Wage Rate Per Hour: 50% of Journeyman's rate  
Supplemental Rate Per Hour: \$31.75

**Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) -  
Second 1000 hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 60% of Journeyman's rate  
Supplemental Rate Per Hour: \$31.75

**Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Third  
1000 hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 75% of Journeyman's rate  
Supplemental Rate Per Hour: \$31.75

**Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) -  
Fourth 1000 hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 90% of Journeyman's rate  
Supplemental Rate Per Hour: \$31.75

(Local #731)

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**MARBLE MECHANICS**

**(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)**

**Cutters & Setters - First 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 50% of Journeyman's rate

**NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)**

**Cutters & Setters - Second 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 55% of Journeyman's rate

**Cutters & Setters - Third 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 65% of Journeyman's rate

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Cutters & Setters - Fourth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

**Cutters & Setters - Fifth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 85% of Journeyperson's rate

**Cutters & Setters - Sixth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

**Polishers & Finishers - First 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

**Polishers & Finishers - Second 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

**Polishers & Finishers - Third 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

**Polishers & Finishers - Fourth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 90% of Journeyperson's rate

(Local #7)

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**MASON TENDER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Mason Tender - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.33



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: \$16.16

**Mason Tender - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.33

Supplemental Benefit Rate per Hour: \$16.16

**Mason Tender - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$22.83

Supplemental Benefit Rate per Hour: \$16.16

**Mason Tender - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.33

Supplemental Benefit Rate per Hour: \$16.16

(Local #79)

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**METALLIC LATHER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Metallic Lather (First Year – Called Prior to 6/29/11)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.91

Supplemental Benefit Rate per Hour: \$22.79

**Metallic Lather (Second Year - Called Prior to 6/29/11)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$32.51

Supplemental Benefit Rate per Hour: \$24.44

**Metallic Lather (Third Year - Called Prior to 6/29/11)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$37.57

Supplemental Benefit Rate per Hour: \$25.59

**Metallic Lather (First Year – Called On Or After 6/29/11)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.71

Supplemental Benefit Rate per Hour: \$19.85

**Metallic Lather (Second Year – Called On Or After 6/29/11)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$22.71

Supplemental Benefit Rate per Hour: \$19.85

**Metallic Lather (Third Year – Called On Or After 6/29/11)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.71

Supplemental Benefit Rate per Hour: \$19.85

(Local #46)

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**MILLWRIGHT**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Millwright (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.40

Supplemental Benefit Rate per Hour: \$28.67

**Millwright (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$30.02

Supplemental Benefit Rate per Hour: \$31.87

**Millwright (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$34.64

Supplemental Benefit Rate per Hour: \$36.19

**Millwright (Fourth Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$43.88

Supplemental Benefit Rate per Hour: \$41.50

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

(Local #740)

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**PAVER AND ROADBUILDER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Paver and Roadbuilder - First Year (Minimum 1000 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$25.72

Supplemental Benefit Rate per Hour: \$15.75

**Paver and Roadbuilder - Second Year (Minimum 1000 hours)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.29

Supplemental Benefit Rate per Hour: \$15.75

(Local #1010)

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**PAINTER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Painter - Brush & Roller - First Year**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate per Hour: \$14.20

Supplemental Benefit Rate per Hour: \$10.88

Effective Period: 11/1/2012 - 6/30/2013

Wage Rate per Hour: \$14.40

Supplemental Benefit Rate per Hour: \$10.88

**Painter - Brush & Roller - Second Year**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate per Hour: \$17.75

Supplemental Benefit Rate per Hour: \$14.73

Effective Period: 11/1/2012 - 6/30/2013

Wage Rate per Hour: \$18.00

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: \$14.73

**Painter - Brush & Roller - Third Year**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate per Hour: \$21.30

Supplemental Benefit Rate per Hour: \$17.64

Effective Period: 11/1/2012 - 6/30/2013

Wage Rate per Hour: \$21.60

Supplemental Benefit Rate per Hour: \$17.64

**Painter - Brush & Roller - Fourth Year**

Effective Period: 7/1/2012 - 10/31/2012

Wage Rate per Hour: \$28.40

Supplemental Benefit Rate per Hour: \$23.02

Effective Period: 11/1/2012 - 6/30/2013

Wage Rate per Hour: \$28.80

Supplemental Benefit Rate per Hour: \$23.02

(District Council of Painters)

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**PAINTER - STRUCTURAL STEEL**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Painters - Structural Steel (First Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

**Painters - Structural Steel (Second Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

**Painters - Structural Steel (Third Year)**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

Local #806)

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## **PLASTERER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

### **Plasterer - First Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 40% of Journeyman's rate

Supplemental Rate Per Hour: \$14.61

### **Plasterer - First Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 45% of Journeyman's rate

Supplemental Rate Per Hour: \$15.09

### **Plasterer - Second Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 55% of Journeyman's rate

Supplemental Rate Per Hour: \$17.06

### **Plasterer - Second Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 60% of Journeyman's rate

Supplemental Rate Per Hour: \$18.14

### **Plasterer - Third Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 70% of Journeyman's rate

Supplemental Rate Per Hour: \$20.31

### **Plasterer - Third Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 75% of Journeyman's rate

Supplemental Rate Per Hour: \$21.39

(Local #530)

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## **PLUMBER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

### **Plumber - First Year: 1st Six Months**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$14.00

Supplemental Benefit Rate per Hour: \$0.71

**Plumber - First Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$14.00

Supplemental Benefit Rate per Hour: \$2.96

**Plumber - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.96

Supplemental Benefit Rate per Hour: \$16.25

**Plumber - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$20.06

Supplemental Benefit Rate per Hour: \$16.25

**Plumber - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$22.91

Supplemental Benefit Rate per Hour: \$16.25

**Plumber - Fifth Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$24.31

Supplemental Benefit Rate per Hour: \$16.25

**Plumber - Fifth Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$36.38

Supplemental Benefit Rate per Hour: \$16.25

(Plumbers Local #1)

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**POINTER - WATERPROOFER, CAULKER MECHANIC (EXTERIOR BUILDING  
RENOVATION)**

**(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Pointer - Waterproofer, Caulker Mechanic - First Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$25.00  
Supplemental Benefit Rate per Hour: \$3.45

**Pointer - Waterproofer, Caulker Mechanic - Second Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$27.25  
Supplemental Benefit Rate per Hour: \$8.40

**Pointer - Waterproofer, Caulker Mechanic - Third Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$32.23  
Supplemental Benefit Rate per Hour: \$11.15

**Pointer - Waterproofer, Caulker Mechanic - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$38.66  
Supplemental Benefit Rate per Hour: \$11.15

(Bricklayer District Council)

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**ROOFER**

**(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 2)**

**Roofer - First Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 35% of Journeyman's Rate

**Roofer - Second Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 50% of Journeyman's Rate

**Roofer - Third Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage and Supplemental Rate Per Hour: 60% of Journeyman's Rate

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Roofer - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 75% of Journeyman's Rate

(Local #8)

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**SHEET METAL WORKER**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

**Sheet Metal Worker - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 30% of Journeyman's rate

Supplemental Rate Per Hour: \$15.37

**Sheet Metal Worker - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 35% of Journeyman's rate

Supplemental Rate Per Hour: \$18.24

**Sheet Metal Worker - Third Year (1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 40% of Journeyman's rate

Supplemental Rate Per Hour: \$20.06

**Sheet Metal Worker - Third Year (2nd Six Months)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 45% of Journeyman's rate

Supplemental Rate Per Hour: \$21.87

**Sheet Metal Worker - Fourth Year (1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Rate Per Hour: \$23.69

**Sheet Metal Worker - Fourth Year (2nd Six Months)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 55% of Journeyman's rate

Supplemental Rate Per Hour: \$25.33



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Sheet Metal Worker - Fifth Year (1st Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 60% of Journeyperson's rate  
Supplemental Rate Per Hour: \$27.47

**Sheet Metal Worker - Fifth Year(2nd Six Months)**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 70% of Journeyperson's rate  
Supplemental Rate Per Hour: \$31.23

(Local #28)

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**SIGN ERECTOR**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Sign Erector - First Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 35% of Journeyperson's rate  
Supplemental Rate Per Hour: \$5.96

**Sign Erector - First Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 40% of Journeyperson's rate  
Supplemental Rate Per Hour: \$6.75

**Sign Erector - Second Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 45% of Journeyperson's rate  
Supplemental Rate Per Hour: \$7.55

**Sign Erector - Second Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 50% of Journeyperson's rate  
Supplemental Rate Per Hour: \$8.34

**Sign Erector - Third Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 55% of Journeyperson's rate  
Supplemental Rate Per Hour: \$9.13

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Sign Erector - Third Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 60% of Journeyperson's rate  
Supplemental Rate Per Hour: \$9.92

**Sign Erector - Fourth Year: 1st Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 65% of Journeyperson's rate  
Supplemental Rate Per Hour: \$10.72

**Sign Erector - Fourth Year: 2nd Six Months**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 70% of Journeyperson's rate  
Supplemental Rate Per Hour: \$11.51

**Sign Erector - Fifth Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 75% of Journeyperson's rate  
Supplemental Rate Per Hour: \$12.30

**Sign Erector - Sixth Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate Per Hour: 80% of Journeyperson's rate  
Supplemental Rate Per Hour: \$12.30

(Local #137)

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**STEAMFITTER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

**Steamfitter - First Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate and Supplemental Per Hour: 40% of Journeyperson's rate

**Steamfitter - Second Year**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate and Supplemental Rate Per Hour: 50% of Journeyperson's rate.

**Steamfitter - Third Year**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate and Supplemental Rate per Hour: 65% of Journeyperson's rate.

**Steamfitter - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate and Supplemental Rate Per Hour: 80% of Journeyperson's rate.

**Steamfitter - Fifth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate and Supplemental Rate Per Hour: 85% of Journeyperson's rate.

(Local #638)

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**STONE MASON - SETTER**

(Ratio Apprentice of Journeyperson: 1 to 1, 1 to 2)

**Stone Mason - Setters - First 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

**Stone Mason - Setters - Second 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 60% of Journeyperson's rate

Supplemental Rate Per Hour: 50% of Journeyperson's rate

**Stone Mason - Setters - Third 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 70% of Journeyperson's rate

Supplemental Rate Per Hour: 50% of Journeyperson's rate

**Stone Mason - Setters - Fourth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyperson's rate

Supplemental Rate Per Hour: 50% of Journeyperson's rate

**Stone Mason - Setters - Fifth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 90% of Journeyperson's rate

Supplemental Rate Per Hour: 50% of Journeyperson's rate

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

**Stone Mason - Setters - Sixth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 100% of Journeyperson's rate

Supplemental Rate Per Hour: 50% of Journeyperson's rate

(Bricklayers District Council)

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**TAPER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Drywall Taper - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

**Drywall Taper - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

**Drywall Taper - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

(Local #1974)

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**TILE LAYER - SETTER**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

**Tile Layer - Setter - First 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

**Tile Layer - Setter - Second 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 55% of Journeyperson's rate

**Tile Layer - Setter - Third 750 Hours**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 65% of Journeyperson's rate

**Tile Layer - Setter - Fourth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

**Tile Layer - Setter - Fifth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 85% of Journeyperson's rate

**Tile Layer - Setter - Sixth 750 Hours**

Effective Period: 7/1/2012 - 6/30/2013

Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

(Local #7)

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**TIMBERPERSON**

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

**Timberperson - First Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 40% of Journeyperson's rate

Supplemental Rate Per Hour: \$27.49

**Timberperson - Second Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 50% of Journeyperson's rate

Supplemental Rate Per Hour: \$27.49

**Timberperson - Third Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 65% of Journeyperson's rate

Supplemental Rate Per Hour: \$27.49

**Timberperson - Fourth Year**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate Per Hour: 80% of Journeyperson's rate

**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE**

**Supplemental Rate Per Hour: \$27.49**

**(Local #1536)**

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**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE**

**This schedule of prevailing wages and supplemental fringe benefits must be posted at the public work site as required by New York State Labor Law § 231 (6).**

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**LABOR LAW § 230 BUILDING SERVICE EMPLOYEES**

**In accordance with Labor Law §230 et seq. the Comptroller of the City of New York has promulgated this schedule of prevailing wages and supplemental benefits for building service employees engaged on building service contracts in excess of \$1,500.00. Prevailing rates are required to be annexed to and form part of the contract pursuant to §231 (4); however, only rates for trades anticipated by the contracting agency to be required on the work need be annexed to the contract.**

**Contracting agencies that anticipate doing work that may require building service trades or classifications not included in this schedule may request the Comptroller to establish a proper classification and wage determination for the work. Contractors using trades and/or classifications for which the Comptroller has not promulgated wages and benefits do so at their own risk.**

**Labor Law § 231 (6) requires contractors to post on the site of the work a current copy of this schedule of wages and supplements.**

**This schedule is applicable to work performed during the effective period, unless otherwise noted. Changes to this schedule are published on our web site [www.comptroller.nyc.gov](http://www.comptroller.nyc.gov). Contractors must pay the wages and supplements in effect when the building service employee performs the work. Preliminary schedules for future one-year periods appear in the City Record on or about June 1 each succeeding year. Final schedules appear on or about July 1 in the City Record and on our web site [www.comptroller.nyc.gov](http://www.comptroller.nyc.gov).**

**Building service employees on public contracts must receive not less than the prevailing rate of wage and supplements for the classification of work performed. Contractors are solely responsible for maintaining original payroll records delineating, among other things, the hours worked by each employee within a given classification.**

**Employers may pay cash supplements; however, cash payments made in lieu of providing bona fide benefits is considered income to the employee. Employers providing bona fide benefits are credited for the cost of such benefits up to the prevailing benefits rate for the trade at issue. Employers may combine cash supplements with in-kind supplements to meet the prevailing rate minimum.**



OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

Contractors are advised to review the applicable Comptroller's Prevailing Wage Schedule before bidding on public work. Any Prevailing Wage Rate error made by the Contracting Agency, whether in a contract document or other communication, will not preclude a finding against the contractor of a prevailing-wage violation.

Some of the rates in this schedule are based on collective bargaining agreements. These agreements are available for inspection by appointment. Requests for appointments may be made by calling (212) 669-4443, Monday through Friday between the hours of 9 a.m. and 5 p.m.

Answers to questions concerning prevailing trade practices may be obtained from the Classifications Unit by calling (212) 669-7974. Please direct all other compliance issues to; Bureau of Labor Law, Attn: Wasyl Kinach, P.E., Office of the Comptroller, 1 Centre Street, Room 1122, New York, N.Y. 10007; Fax (212) 669-4002.

Benefits are paid for **EACH HOUR WORKED** unless otherwise noted.

Wasyl Kinach, P.E.  
Director of Classifications  
Bureau of Labor Law

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

**BOILER SERVICEPERSON/TANK CLEANER MECHANIC (LOW PRESSURE)**

**Boiler Service Person/Tank Cleaner Mechanic (Low Pressure)**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$11.37

Supplemental Benefit Rate per Hour: \$5.57

**Overtime Description**

Work in excess of 8 hours performed on a Sunday or Holiday shall be paid two and one half times the regular rate.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

**Paid Holidays**

New Year's Day

Martin Luther King Jr. Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Employee's Birthday

**Vacation**

1 year service.....	five (5) days
3 years service or more.....	ten (10) days
8 years service or more.....	fifteen (15) days
13 years service or more.....	twenty (20) days

**SICK LEAVE:**

1-2 years employment.....	4 days
2-3 years employment.....	5 days
3-4 years employment.....	6 days
4-5 years employment.....	8 days
6 years or more employment.....	10 days

(Local #32 B/J)

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**BUILDING CLEANER AND MAINTAINER (OFFICE)**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

**Office Building Class "A" Handyperson (Over 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$24.77

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$25.10

Supplemental Benefit Rate per Hour: \$9.51

**Office Building Class "A" Foreperson, Starter (Over 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$24.66

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$24.99

Supplemental Benefit Rate per Hour: \$9.51

**Office Building Class "A" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Over 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$22.65

Supplemental Benefit Rate per Hour: \$9.13

Supplemental Note: for new employee 0-12 months of employment - \$6.64; for new employee 13-24 months of employment - \$8.81

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$22.97

Supplemental Benefit Rate per Hour: \$9.51

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Office Building Class "B" Handyperson (Over 120,000 and less than 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$24.74

Supplemental Benefit Rate per Hour: \$9.13

**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Effective Period: 1/1/2013 - 6/30/2013  
Wage Rate per Hour: \$25.07  
Supplemental Benefit Rate per Hour: \$9.51

**Office Building Class "B" Foreperson, Starter (Over 120,000 and less than 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012  
Wage Rate per Hour: \$24.63  
Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013  
Wage Rate per Hour: \$24.95  
Supplemental Benefit Rate per Hour: \$9.51

**Office Building Class "B" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Over 120,000 and less than 280,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012  
Wage Rate per Hour: \$22.62  
Supplemental Benefit Rate per Hour: \$9.13  
Supplemental Note: for new employee 0-12 months of employment - \$6.64; for new employee 13-24 months of employment - \$8.81

Effective Period: 1/1/2013 - 6/30/2013  
Wage Rate per Hour: \$22.94  
Supplemental Benefit Rate per Hour: \$9.51  
Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

**NEW HIRE:** Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Office Building Class "C" Handyperson (Less than 120,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012  
Wage Rate per Hour: \$24.70  
Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013  
Wage Rate per Hour: \$25.02  
Supplemental Benefit Rate per Hour: \$9.51

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\$230 PREVAILING WAGE SCHEDULE

**Office Building Class "C" Foreperson, Starter (Less than 120,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$24.59

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$24.91

Supplemental Benefit Rate per Hour: \$9.51

**Office Building Class "C" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Less than 120,000 square feet gross area)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$22.57

Supplemental Benefit Rate per Hour: \$9.13

Supplemental Note: for new employee 0-12 months of employment - \$6.64; for new employee 13-24 months of employment - \$8.81

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$22.90

Supplemental Benefit Rate per Hour: \$9.51

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

**NEW HIRE:** Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for work on a holiday plus the day's pay.

Time and one half the regular hourly rate after 40 hours in any work week.

**Paid Holidays**

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

**Vacation**

**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Less than 6 months of work.....no vacation  
6 months of work.....three (3) days  
1 year of work.....ten (10) days  
5 years of work.....fifteen (15) days  
15 years of work.....twenty (20) days  
21 years of work.....twenty-one (21) days  
22 years of work.....twenty-two (22) days  
23 years of work.....twenty-three (23) days  
24 years of work.....twenty-four (24) days  
25 years or more of work.....twenty-five (25) days  
Plus two Personal Days per year.

**Sick Leave:**

10 sick days per year.

Unused sick leave paid in the succeeding January, one full day pay for each unused sick day.

(Local #32 B/J)

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## **BUILDING CLEANER AND MAINTAINER (RESIDENTIAL)**

### **Residential Building Class "A" Handyperson**

**Residential Buildings Class "A":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$4000.00 a room.

**Effective Period: 7/1/2012 – 4/20/2013**

**Wage Rate per Hour: \$22.94**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note: Effective 1/1/2013 - \$9.43**

**Effective Period: 4/21/2013 - 6/30/2013**

**Wage Rate per Hour: \$23.57**

**Supplemental Benefit Rate per Hour: \$9.43**

### **Residential Building Class "A" Cleaner/Porter**

**Residential Buildings Class "A":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$4000.00 a room.

**Effective Period: 7/1/2012 - 4/20/2013**

**Wage Rate per Hour: \$20.77**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note: for new employee 0-12 months of employment - \$6.37; for new employee 13-24 months of employment - \$8.43**

**Effective 1/1/2013 - \$9.43; for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18**

**Effective Period: 4/21/2013 - 6/30/2013**

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**Wage Rate per Hour: \$21.34**

**Supplemental Benefit Rate per Hour: \$9.43**

**Supplemental Note:** for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

**NEW HIRE:** Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Residential Building Class "B" Handyperson**

**Residential Building Class "B":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$2000.00 a room and not over \$4000.00 a room.

**Effective Period: 7/1/2012 - 4/20/2013**

**Wage Rate per Hour: \$22.88**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note:** Effective 1/1/2013 - \$9.43

**Effective Period: 4/21/2013 - 6/30/2013**

**Wage Rate per Hour: \$23.51**

**Supplemental Benefit Rate per Hour: \$9.43**

**Residential Building Class "B" Cleaner/Porter**

**Residential Building Class "B":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$2000.00 a room and not over \$4000.00 a room.

**Effective Period: 7/1/2012 - 4/20/2013**

**Wage Rate per Hour: \$20.71**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note:** for new employee 0-12 months of employment - \$6.37; for new employee 13-24 months of employment - \$8.43

**Effective 1/1/2013 - \$9.43; for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18**

**Effective Period: 4/21/2013 - 6/30/2013**

**Wage Rate per Hour: \$21.28**

**Supplemental Benefit Rate per Hour: \$9.43**

**Supplemental Note:** for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

**NEW HIRE:** Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Residential Building Class "C" Handyperson**



**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE**

**Residential Building Class "C":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of \$2000.00 or less a room.

**Effective Period: 7/1/2012 - 4/20/2013**

**Wage Rate per Hour: \$22.83**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note: Effective 1/1/2013 - \$9.43**

**Effective Period: 4/21/2013 - 6/30/2013**

**Wage Rate per Hour: \$23.45**

**Supplemental Benefit Rate per Hour: \$9.43**

**Residential Building Class "C" Cleaner/Porter**

**Residential Building Class "C":** buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of \$2000.00 or less a room.

**Effective Period: 7/1/2012 - 4/20/2013**

**Wage Rate per Hour: \$20.65**

**Supplemental Benefit Rate per Hour: \$8.68**

**Supplemental Note: for new employee 0-12 months of employment - \$6.37; for new employee 13-24 months of employment - \$8.43**

**Effective 1/1/2013 - \$9.43; for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18**

**Effective Period: 4/21/2013 - 6/30/2013**

**Wage Rate per Hour: \$21.23**

**Supplemental Benefit Rate per Hour: \$9.43**

**Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18**

**NEW HIRE:** Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

**Overtime**

**Time and one half the regular rate after an 8 hour day.**

**Time and one half the regular rate for work on a holiday plus the day's pay.**

**Time and one half the regular hourly rate after 40 hours in any work week.**

**Paid Holidays**

**New Year's Day**

**Martin Luther King Jr. Day**

**President's Day**

**Memorial Day**

**Independence Day**

**Labor Day**

**Columbus Day**

**Election Day**

**Thanksgiving Day**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

Christmas Day

**Vacation**

6 months.....three (3) days  
1 year.....ten (10) days  
5 years.....fifteen (15) days  
15 years.....twenty (20) days  
21 years.....twenty-one (21) days  
22 years.....twenty-two (22) days  
23 years.....twenty-three (23) days  
24 years.....twenty-four (24) days  
25 years.....twenty-five (25) days  
Plus two Personal Days per year.

**SICK LEAVE**

After 1 year of service.....ten (10) days per year

(Local #32 B/J)

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**BUILDING HVAC SERVICES OPERATOR**

**Engineer (Refrigeration)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$34.15

Supplemental Benefit Rate per Hour: \$15.44

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$35.18

Supplemental Benefit Rate per Hour: \$15.78

**Fireperson**

Fireperson (Helper): Assists the Engineer

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$26.59

Supplemental Benefit Rate per Hour: \$15.09

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$27.39

Supplemental Benefit Rate per Hour: \$15.41

**Overtime Description**

All hours worked on a holiday shall be paid at two and one half times the regular wage rate in lieu of the paid day off.

**Overtime**

Time and one half the regular rate after an 8 hour day.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Time and one half the regular rate for Saturday.  
Time and one half the regular rate for Sunday.

**Paid Holidays**

New Year's Day  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day  
Plus six (6) floating Holidays

**Vacation**

6 months .....	three (3) days
1 year .....	ten (10) days
5 years .....	fifteen (15) days
15 years .....	twenty (20) days
21 years.....	twenty-one (21) days
22 years .....	twenty-two (22) days
23 years .....	twenty-three (23) days
24 years .....	twenty-four (24) days
25 years .....	twenty-five (25) days

(Local #94)

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**CLEANER (PARKING GARAGE)**

**Garage Cleaner**

Effective Period: 7/1/2012 - 6/30/2013  
Wage Rate per Hour: \$10.00  
Supplemental Benefit Rate per Hour: \$1.50

**Overtime**

Time and one half the regular rate after an 8 hour day or after 40 hours in any work week.

(NYC Administrative Code §6-109)

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**FUEL OIL**

**Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (5th Year and above)**

Effective Period: 7/1/2012 - 12/15/2012  
Wage Rate per Hour: \$30.11  
Supplemental Benefit Rate per Hour: \$18.80

Effective Period: 12/16/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Wage Rate per Hour: \$30.61

Supplemental Benefit Rate per Hour: \$19.80

Supplemental Note: Effective 1/1/2013 - \$20.42

**Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (4th Year)**

Effective Period: 7/1/2012 - 12/15/2012

Wage Rate per Hour: \$27.50

Supplemental Benefit Rate per Hour: \$18.80

Effective Period: 12/16/2012 - 6/30/2013

Wage Rate per Hour: \$28.00

Supplemental Benefit Rate per Hour: \$19.80

Supplemental Note: Effective 1/1/2013 - \$20.42

**Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (3rd Year)**

Effective Period: 7/1/2012 - 12/15/2012

Wage Rate per Hour: \$25.50

Supplemental Benefit Rate per Hour: \$18.80

Effective Period: 12/16/2012 - 6/30/2013

Wage Rate per Hour: \$26.00

Supplemental Benefit Rate per Hour: \$19.80

Supplemental Note: Effective 1/1/2013 - \$20.42

**Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (2nd Year)**

Effective Period: 7/1/2012 - 12/15/2012

Wage Rate per Hour: \$23.50

Supplemental Benefit Rate per Hour: \$18.80

Effective Period: 12/16/2012 - 6/30/2013

Wage Rate per Hour: \$24.00

Supplemental Benefit Rate per Hour: \$19.80

Supplemental Note: Effective 1/1/2013 - \$20.42

**Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (1st Year)**

Effective Period: 7/1/2012 - 12/15/2012

Wage Rate per Hour: \$21.50

Supplemental Benefit Rate per Hour: \$18.80

Effective Period: 12/16/2012 - 6/30/2013

Wage Rate per Hour: \$22.00

Supplemental Benefit Rate per Hour: \$19.80

Supplemental Note: Effective 1/1/2013 - \$20.42

**Overtime**

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Time and one half the regular rate after an 8 hour day.  
Time and one half the regular rate for Saturday.  
Double time the regular rate for Sunday.

**Overtime Holidays**

Double time the regular rate for work on the following holiday(s).

Martin Luther King Jr. Day  
Lincoln's Birthday  
Washington's Birthday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Election Day  
Veteran's Day

Triple time the regular rate for work on the following holiday(s).

New Year's Day  
Thanksgiving Day  
Christmas Day

**Paid Holidays**

New Year's Day  
Martin Luther King Jr. Day  
Lincoln's Birthday  
Washington's Birthday  
Memorial Day  
Independence Day  
Labor Day  
Columbus Day  
Election Day  
Veteran's Day  
Thanksgiving Day  
Christmas Day

**Vacation**

Less than 75 days worked.....no vacation.  
75 days worked, but less than 110 days worked in a calendar year.....five (5) days the following year.  
110 days or more worked in a calendar year.....ten (10) days the following year.

**SICK LEAVE:**

1 day sick leave earned for each 40 days worked in the preceding calendar year for a maximum of five (5) days per calendar year.

(Local #553)

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**GARDENER**

**Gardener**

Effective Period: 7/1/2012 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: **\$17.04**

Supplemental Benefit Rate per Hour: **\$1.72**

**Overtime**

Time and one half the regular rate after an 8 hour day or after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

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**LOCKSMITH**

**Locksmith**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: **\$21.46**

Supplemental Benefit Rate per Hour: **\$5.89**

**Overtime**

Time and one half the regular rate after an 8 hour day or after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

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**MEDICAL WASTE REMOVAL**

**Driver**

Effective Period: 7/1/2012 - 3/31/2013

Wage Rate per Hour: **\$17.75**

Supplemental Benefit Rate per Hour: **\$8.79**

Effective Period: 4/1/2013 - 6/30/2013

Wage Rate per Hour: **\$18.00**

Supplemental Benefit Rate per Hour: **\$9.34**

**Helper**

Effective Period: 7/1/2012 - 3/31/2013

Wage Rate per Hour: **\$14.00**

Supplemental Benefit Rate per Hour: **\$8.79**

Effective Period: 4/1/2013 - 6/30/2013

Wage Rate per Hour: **\$14.25**

Supplemental Benefit Rate per Hour: **\$9.34**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

**Tractor Trailer Driver**

Effective Period: 7/1/2012 - 3/31/2013

Wage Rate per Hour: \$20.25

Supplemental Benefit Rate per Hour: \$8.79

Effective Period: 4/1/2013 - 6/30/2013

Wage Rate per Hour: \$20.50

Supplemental Benefit Rate per Hour: \$9.34

**Overtime Description**

Time and one half the regular hourly rate after an 8 hour day or after 40 hours in any work week. The seventh day of work in a workweek is paid at double time the regular hourly rate. Time and one half the regular hourly rate for work on a holiday plus days pay for below paid holidays.

**Paid Holidays**

Presidents' Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

**Vacation**

1 year of service but less than five years.....	10 days
5 years of service but less than ten years.....	15 days
10 years of service.....	16 days
11 years.....	17 days
12 years.....	18 days
13 years.....	19 days
14 years.....	20 days
20 years.....	21 days
21 years.....	22 days
22 years.....	23 days
23 years.....	24 days
24 years.....	25 days

Plus 5 Personal Days

(Local #813)

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**MOVER – OFFICE FURNITURE AND EQUIPMENT**

**Heavy and Tractor Trailer Truck Driver**

Tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW)

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$23.11

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Supplemental Benefit Rate per Hour: \$4.10

**Light Truck Driver**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$18.08

Supplemental Benefit Rate per Hour: \$4.10

**Laborer and Freight, Stock, and Material Movers, Hand**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$17.68

Supplemental Benefit Rate per Hour: \$4.10

**Overtime**

Time and one half the regular rate after an 8 hour day or after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

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**REFUSE REMOVER**

**Refuse Remover**

Effective Period: 7/1/2012 - 6/30/2013

Wage Rate per Hour: \$27.62

Supplemental Benefit Rate per Hour: \$4.10

**Overtime**

Time and one half the regular rate after an 8 hour day or after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

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**SECURITY GUARD (ARMED)**

**Security Guard (Armed)**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$27.75

Supplemental Benefit Rate per Hour: \$4.73

Supplemental Note: for new employee 0-30 days of employment - \$4.09; for new employee 31-120 days of employment - \$4.26; for new employee 121 days - 2 years of employment - \$4.37

Effective Period: 1/1/2013 - 6/30/2013



**OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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**Wage Rate per Hour: \$28.00**

**Supplemental Benefit Rate per Hour: \$4.90**

**Supplemental Note:** for new employee 0-30 days of employment - \$4.26; for new employee 31-120 days of employment - \$4.43; for new employee 121 days - 2 years of employment - \$4.54

Months of employment shall be defined as an Employee's length of service with the Employer or at the Facility, whichever is greater.

### **Overtime Description**

A guard who works a holiday is paid the regular rate plus receives the paid holiday.

Supplemental Benefits shall be paid for each hour paid, up to forty (40) paid hours per week.

### **Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

### **Paid Holidays**

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

### **Vacation**

Months on payroll	Vacation with Pay
6	3 days
12	5 days
24	10 days
60	15 days
180	20 days
300	25 days

### **Sick Leave**

Employees accrue paid sick leave at the rate of one (1) sick day for every six (6) months worked, up to a maximum of six (6) days a year.

(Local #32B/J)

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## **SECURITY GUARD (UNARMED)**

### **Security Guard (Unarmed) 0 - 6 months**

**Effective Period: 7/1/2012 - 12/31/2012**

**Wage Rate per Hour: \$12.60**

**Supplemental Benefit Rate per Hour: \$4.37**

**Supplemental Note:** for new employee 0-30 days of employment - \$4.09; for new employee 31-120 days of employment - \$4.26

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
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Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$12.85

Supplemental Benefit Rate per Hour: \$4.54

Supplemental Note: for new employee 0-30 days of employment - \$4.26; for new employee 31-120 days of employment - \$4.43

**Security Guard (Unarmed) 7 - 12 months**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$13.10

Supplemental Benefit Rate per Hour: \$4.37

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$13.35

Supplemental Benefit Rate per Hour: \$4.54

**Security Guard (Unarmed) 13 - 18 months**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$13.60

Supplemental Benefit Rate per Hour: \$4.37

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$13.85

Supplemental Benefit Rate per Hour: \$4.54

**Security Guard (Unarmed) 19 - 24 months**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$14.10

Supplemental Benefit Rate per Hour: \$4.37

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$14.35

Supplemental Benefit Rate per Hour: \$4.54

**Security Guard (Unarmed) 25 - 30 months**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$14.60

Supplemental Benefit Rate per Hour: \$4.73

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$14.85

Supplemental Benefit Rate per Hour: \$4.90

**Security Guard (Unarmed) 31 months or more**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$14.75

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: \$4.73

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$15.15

Supplemental Benefit Rate per Hour: \$4.90

Months of employment shall be defined as an Employee's length of service with the Employer or at the Facility, whichever is greater.

### Overtime Description

A guard who works a holiday is paid the regular rate plus receives the paid holiday.

Supplemental Benefits shall be paid for each hour paid, up to forty (40) paid hours per week.

### Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

### Paid Holidays

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

### Vacation

Months on payroll	Vacation with Pay
6	3 days
12	5 days
24	10 days
60	15 days
180	20 days
300	25 days

### Sick Leave

Employees accrue paid sick leave at the rate of one (1) sick day for every six (6) months worked, up to a maximum of six (6) days a year.

(Local #32B/J)

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## WINDOW CLEANER

### Window Cleaner

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$26.12

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
\$230 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$26.44

Supplemental Benefit Rate per Hour: \$9.51

**Power Operated Scaffolds, Manual Scaffolds, and Boatswain Chairs**

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$28.37

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$28.69

Supplemental Benefit Rate per Hour: \$9.51

**Window Cleaner Apprentice (0 - 3 months)**

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$19.35

Supplemental Benefit Rate per Hour: \$0.00

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$19.59

Supplemental Benefit Rate per Hour: \$0.00

**Window Cleaner Apprentice (4 - 7 months)**

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$20.92

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$21.18

Supplemental Benefit Rate per Hour: \$9.51

**Window Cleaner Apprentice (8 - 11 months)**

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: \$22.17

Supplemental Benefit Rate per Hour: \$9.13

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: \$22.44

Supplemental Benefit Rate per Hour: \$9.51

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

**Window Cleaner Apprentice (12 - 15 months)**

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: **\$23.43**

Supplemental Benefit Rate per Hour: **\$9.13**

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: **\$23.72**

Supplemental Benefit Rate per Hour: **\$9.51**

**Window Cleaner Apprentice (16 - 17 months)**

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2012 - 12/31/2012

Wage Rate per Hour: **\$24.70**

Supplemental Benefit Rate per Hour: **\$9.13**

Effective Period: 1/1/2013 - 6/30/2013

Wage Rate per Hour: **\$25.01**

Supplemental Benefit Rate per Hour: **\$9.51**

**Overtime**

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on a holiday plus the day's pay.

**Paid Holidays**

New Year's Day

Martin Luther King Jr. Day

President's Birthday

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Personal Day

**Vacation**

After 7 months but less than 1 year of service.....5 days

1 year but less than 5 years of service.....10 days

5 years of service but less than 15 years of service.....15 days

15 years of service but less than 21 years of service.....20 days

21 years.....21 days

22 years.....22 days

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK  
§230 PREVAILING WAGE SCHEDULE

.....years.....23 days  
24 years.....24 days  
25 years or more of service.....25 days  
Plus 1 day per year for medical visit

**SICK LEAVE:**

10 days after one year worked. Unused sick days to be paid in cash.

(Local #32 B/J)

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# **SECTION 01000**

## **GENERAL CONDITIONS**

**APPLICABLE TO ALL CONTRACTS**



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The ADDENDUM TO THE GENERAL CONDITIONS is contained in Volume 3 of the Contract Documents. Volume 3 contains the following:

- Addendum to the General Conditions
- Specifications

## SECTION 01000 GENERAL CONDITIONS

### PART 1 - GENERAL

#### 1.01 Applicability of General Conditions

- A. Since there are several separate Contracts pertaining to the construction of this project, for convenience, the General Conditions are stated only once. These General Conditions are applicable to all Contracts and shall constitute an integral part of each separate Contract to the same extent as though they were repeated in full therein.
- B. The Contractor is advised that various sections of these General Conditions are amended by the Addendum to the General Conditions. This Addendum also includes various schedules referred to in these General Conditions (Schedules A through F). These schedules contain important information that is specific to this project. The Addendum, including Schedules A through F, is set forth in Volume 3 of the Contract Documents.
- C. Throughout these General Conditions, various responsibilities and obligations are assigned to each of the following four Contractors: (1) General Construction, (2) Plumbing, (3) Heating/Ventilating/Air-Conditioning/Fire Protection, and (4) Electrical. In the event the Project does not involve all four Contracts, the responsibilities and obligations of each omitted Contract shall be assigned to one of the Contracts which is included in the Project. The Addendum to the General Conditions specifies which Contractor shall perform the responsibilities and obligations of each omitted contract, as set forth in the General Conditions.

#### 1.02 Scope and Intent

- A. DESCRIPTION OF PROJECT - Refer to the Addendum to the General Conditions for a description of this project.
- B. PROGRESS SCHEDULE
  - 1. Within 15 days after the Notice to Proceed, the Contractor for General Construction Work shall prepare a composite Job Progress Chart that shall indicate graphically and chronologically the time the various parts of the work of all Contracts shall commence and be completed. The Chart shall be in a reproducible form approved by the Commissioner.
  - 2. Immediately after the Notice to Proceed of their Contracts, the Contractors for Plumbing Work, Heating, Ventilating and Air Conditioning Work (HVAC) and Electrical Work, as applicable, shall furnish all necessary data to the Contractor for General Construction Work, and cooperate in all respects in connection with formulation of the Chart.
  - 3. The Chart shall show the sequence and interrelationship of each operation of all the Contracts.
  - 4. The Chart shall show the estimated time for fabrication and/or delivery of all materials and equipment required for the work.
  - 5. As directed by the Resident Engineer, the Contractors shall meet with each other and with the Resident Engineer to review and make the necessary adjustments to the composite Job Progress Chart, and to coordinate the work indicated thereon. (Article 12 of the Contract).
  - 6. When completed, the Job Progress Chart shall be signed and dated by each Contractor or their official representative. The Resident Engineer is authorized to sign the Chart for the Department of Design and Construction. Thereafter, the Chart shall be modified only with the Commissioner's approval. When directed by the Commissioner, the Chart shall be revised and updated. If necessary, a new revised Chart shall be prepared in the same manner as outlined above for the original Chart.

7. The approved Chart shall be distributed by the Contractor for General Construction Work, as follows: the original and two (2) copies to the Resident Engineer, two (2) copies to each Contractor, and two (2) copies to the Department of Design and Construction
  8. All Contractors shall consult the approved Progress Chart and install their work within the time limits indicated on the Chart.
  9. The Resident Engineer shall post in a prominent place in the field office a copy of the Chart and mark thereon the progress of the work, including the times when various parts of the work commenced and were completed.
- C. COMPLETION OF WORK - Work to be done under each separate Contract comprises the furnishing of all labor, materials, equipment and other appurtenances and obtaining of all regulatory agency approvals necessary and required to complete the construction work in accordance with the Contract.
- D. OMISSION OF DETAILS - All work called for in the Specifications applicable to each separate Contract but not shown on the Contract Drawings in their present form, or vice versa, is required, and shall be performed by the Contractor as though it were originally delineated or described. Such work is deemed included in the Bid Price.
- E. WORK NOT IN SPECIFICATIONS OR CONTRACT DRAWINGS - Work not particularly specified in the Specifications nor detailed on the Contract Drawings but involved in carrying out their intent or in the complete and proper execution of the work, is required, and shall be performed by the Contractor. Such work is deemed included in the Bid Price.
- F. SILENCE OF THE SPECIFICATIONS - The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best practice is to prevail and that only the best material and workmanship is to be used and interpretation of the Specifications shall be made upon that basis.
- G. CONFLICT BETWEEN CONTRACT DRAWINGS AND SPECIFICATIONS - Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the most expensive way of doing the work unless the Contractor shall have asked for and obtained a decision in writing from the Commissioner before the submission of the bid as to what shall govern.
- H. COOPERATION BETWEEN CONTRACTORS - Inasmuch as the completion of the project within the prescribed limit of time is dependent largely upon the close and active cooperation of all those engaged therein, it is therefore expressly understood and agreed that the Contractor shall lay out and install all work at such time or times and in such manner as not to delay or interfere with the carrying forward of the work of other Contractors. In the event of any dispute arising as to possible or alleged interference between the various Contractors which may retard the progress of the work, the dispute shall be adjudicated by the Commissioner, whose decision as to the party or parties at fault and as to the manner in which the matter may be adjudicated, shall be binding and conclusive on all parties.
- I. "DIRECTED," "REQUIRED," ETC.- Wherever reference is made in the Contract to the work or its performance, the terms "directed," "required," "permitted," "ordered," "designated," "prescribed," "determined," and words of similar import shall, unless expressed otherwise, imply the direction, requirements, permission, order, designation or prescription of the Commissioner.
- J. "APPROVED," ETC. - "Approved," "acceptable," "satisfactory," and words of similar import shall mean and intend approved, acceptable or satisfactory to the Commissioner.
- K. CONFLICTS OF INTERESTS - The Charter of the City of New York, Section 2604, provides a number of safeguards in relation to conflicts of interest. Such safeguards include, without limitation, the following: "No public servant shall receive compensation except from the City for performing any official duty or accept or receive any gratuity from any person whose interest may be affected by the

public servant's official action."

1. Other sections of the City Charter, the Administrative Code and the Penal Law are applicable in implementing the basic Conflicts of Interest Section and under certain circumstances penalties may be invoked against the donor as well as the recipient of any form of valuable gift.
2. Notice is hereby given that sections of the City Charter, the Administrative Code and the Penal Law alluded to herein shall apply under the terms of this Contract to circumstances relevant to conflicts of interest and shall be extended in application to subcontractors authorized to perform work, labor and services pursuant to this Contract and further, it shall be the duty and responsibility of the Contractors to so inform their respective subcontractors.

### **1.03 Provisions Referenced in the Contract**

- A. Various Articles of the Contract refer to requirements set forth in Schedule A of the General Conditions. Schedule A, which is included in the Addendum to the General Conditions, sets forth 1) the referenced Articles of the Contract, and 2) the specific requirements applicable to each respective Contract.
- B. Applications for Extensions of Time, as indicated in Article 13 of the Contract, shall be made in accordance with the Rules of the Procurement Policy Board.
- C. **PARTIAL PAYMENTS FOR MATERIALS IN ADVANCE OF THEIR INCORPORATION IN THE WORK PURSUANT TO ARTICLE 42 OF THE "CONTRACT"** - In order to better insure the availability of materials, fixtures and equipment when needed for the work, the Commissioner may authorize partial payment for certain materials, fixtures and equipment, prior to their incorporation in the work, but only in strict accordance with, and subject to, all the terms and conditions set forth in the Specifications, unless an alternate method of payment is elsewhere provided in the Specifications for specified materials, fixtures or equipment.
  1. The Contractor shall submit to the Commissioner a written request, in quadruplicate, for payment for materials purchased or to be purchased for which the Contractor needs to be paid prior to their actual incorporation in the work. The request shall be accompanied by a schedule of the types and quantities of materials, and shall state whether such materials are to be stored on or off the site.
  2. Where the materials are to be stored off the site, they shall be stored at a place other than the Contractor's premises (except with the written consent of the Commissioner) and under the conditions prescribed or approved by the Commissioner. The Contractor shall set apart and separately store at the place or places of storage all materials and shall clearly mark same "PROPERTY OF THE CITY OF NEW YORK", and further, shall not at any time move any of said materials to another off-site place of storage without the prior written consent of the Commissioner. Materials may be removed from their place of storage off the site for incorporation in the work upon approval of the Resident Engineer.
  3. Where the materials are to be stored at the site, they shall be stored at such locations as shall be designated by the Resident Engineer and only in such quantities as, in the opinion of the Resident Engineer, will not interfere with the proper performance of the work by the Contractor or by other Contractors then engaged in performing work on the site. Such materials shall not be removed from their place of storage on the site except for incorporation in the work, without the approval of the Resident Engineer.
4. **INSURANCE**
  - a. **STORAGE OFF-SITE** - Where the materials are stored off the site and until such time as they are incorporated in the work, the Contractor shall fully insure such materials against any and all risks of destruction, damage or loss including but not limited to fire, theft, and any other casualty or happening. The policy of insurance shall be payable to the City of New York. It shall be in such terms and amounts as shall be approved by the Commissioner and shall be

placed with a company duly licensed to do business in the State of New York. The Contractor shall deliver the original and one (1) copy of such policy or policies marked "Fully Paid" to the Commissioner.

- b. STORAGE ON THE SITE - Where the materials are stored at the site, the Contractor shall furnish satisfactory evidence to the Commissioner that they are properly insured against loss, by endorsements or otherwise, under the policy or policies of insurance obtained by the Contractor to cover losses to materials owned or installed by the Contractor. The policy of insurance shall cover fire and extended coverage against windstorm, hail, explosion and riot attending a strike, civil commotion, aircraft, vehicles and smoke.
5. All costs, charges and expenses arising out of the storage of such materials, shall be paid by the Contractor and the City hereby reserves the right to retain out of any partial or final payment made under the Contract an amount sufficient to cover such costs, charges and expenses with the understanding that the City shall have and may exercise any and all other remedies at law for the recovery of such cost, charges and expenses. There shall be no increase in the Contract price for such costs, charges and expenses and the Contractor shall not make any claim or demand for compensation therefor.
6. The Contractor shall pay any and all costs of handling and delivery of materials, to the place of storage and from the place of storage to the site of the work; and the City shall have the right to retain from any partial or final payment an amount sufficient to cover the cost of such handling and delivery.
7. In the event that the whole or any part of these materials are lost, damaged or destroyed in advance of their satisfactory incorporation in the work, the Contractor, at the Contractor's own cost, shall replace such lost, damaged or destroyed materials of the same character and quality. The City will reimburse the Contractor for the cost of the replaced materials to the extent, and only to the extent, of the funds actually received by the City under the policies of insurance hereinbefore referred to. Until such time as the materials are replaced, the City will deduct from the value of the stored materials or from any other money due under the Contract, the amount paid to the Contractor for such lost, damaged or destroyed materials.
8. Should any of the materials paid for the City hereunder be subsequently rejected or incorporated in the work in a manner or by a method not in accordance with the Contract and Specifications, the Contractor shall remove and replace, at Contractor's own cost, such defective or improperly incorporated material with materials complying with the Contract and Specifications. Until such materials are replaced, the City will deduct from the value of the stored materials or from any other money due the Contractor, the amount paid by the City for such rejected or improperly incorporated materials.
9. Payments for the cost of materials made hereunder shall not be deemed to be an acceptance of such materials as being in accordance with the Contract Documents, and the Contractor always retains and must comply with the Contractor's duty to deliver to the site and properly incorporate in the work only materials which comply with the Contract Documents.
10. The Contractor shall retain any and all risks in connection with the damage, destruction or loss of the materials paid for hereunder to the time of delivery of the same to the site of the work and their proper incorporation in the work in accordance with the Contract Documents.
11. The Contractor shall comply with all laws and the regulations of any governmental body or agency pertaining to the priority purchase, allocation and use of the materials.
12. When requesting payment for such materials, the Contractor shall submit with the partial estimate duly authenticated documents of title, such as bills of sale, invoices or warehouse receipts, all in quadruplicate. The executed bills of sale shall transfer title to the materials from the Contractor to the City (in the event that the invoices state that the material has been purchased by a subcontractor, bills of sale in quadruplicate will also be required transferring title to the materials

from subcontractor to the Contractor).

13. Where the Contractor, with the approval of the Commissioner, has purchased unusually large quantities of materials in order to assure their availability for the work, the Commissioner, at the Commissioner's option, may waive the requirements of Paragraph 12 provided the Contractor furnishes evidence in the form of an affidavit from the Contractor in quadruplicate, and such other proof as the Commissioner may require, that the Contractor is the sole owner of such materials and has purchased them free and clear of all liens and other encumbrances. In such event, the Contractor shall pay for such materials and submit proof thereof, in the same manner as provided in Paragraph 12 hereof, within seven (7) days after receipt of payment therefor from the Comptroller. Failure on the part of the Contractor to submit satisfactory evidence that all such materials have been paid for in full, shall preclude the Contractor from payments under the Contract.
14. The Contractor shall include in each succeeding partial estimate requisition a summary of materials stored which shall set forth the quantity and value of materials in storage, on or off the site, at the end of each preceding estimate period; the amount removed for incorporation in the work; the quantity and value of materials delivered during the current period and the total value of materials on hand for which payment thereof will be included in the current payment estimate.
15. Upon proof to the satisfaction of the Commissioner of the actual cost of such materials and upon submission of proper proof of title as required under Paragraph 12 or Paragraph 13 hereof, payment will be made therefore to the extent of 85%, provided however, that the cost so verified, established and approved shall not exceed the estimated cost of such materials included in the approved detailed breakdown estimate submitted in accordance with Article 41 of the Contract; if it does, the City will pay only 85% approved estimated cost.
16. Upon the incorporation in the work of any such materials, which have been paid for in advance of such incorporation in accordance with the foregoing provisions, payment will be made for such materials incorporated in the work pursuant to Article 42 of the Contract, less any sums paid pursuant to Paragraph 15 herein.

**D. EXCISE AND TRANSPORTATION TAXES-** Pursuant to Section 6 of the "Information for Bidders", the Contractor may be exempted from the payment of Federal Excise and Transportation Taxes in accord with the following:

1. Excise Tax Exemption Certificate will be certified by the Department of Design and Construction where requested by the Contractor, for items which fall within the scope of the Contract and which may be exempt from Federal Excise Tax.
2. TRANSPORTATION TAX - The 3% Federal Tax has been repealed and is hereby deleted from the Contract. The 10% Federal Tax for travel remains in effect.

**E. CORRESPONDENCE** - There shall be six (6) copies of all letters of correspondence to the Department of Design and Construction. An additional copy of all correspondence shall be sent directly to the Resident Engineer at the job site.

**F. MOBILIZATION PAYMENT** - A line item for mobilization shall be allowed on the Contractor's Detailed Estimate Breakdown submitted in accordance with Article 41 of the Contract. The Mobilization Payment is intended to include the cost of required bonds, insurance coverage and/or any other expenses required for the initiation of the Contract Work. All costs for mobilization shall be deemed included in the total Contract Price. The Detailed Estimate shall reflect, and the Mobilization Payment shall be made, in accordance with the following schedule:

Contract Amount		Percent		Mobilization	
Less than \$	50,000	x	0 =	0	
\$	50,000 - \$	100,000	= \$	6,000	
\$	100,001 - \$	500,000	x	6 = \$	6,000 (min) - \$ 30,000 (max)

\$ 500,001 - \$ 2,500,000	x	5	=	\$ 30,000 (min) - \$ 125,000 (max)
Over \$ 2,500,000	x	4	=	\$ 125,000 (min) - \$ 300,000 (max)

The Contractor may requisition for one-half (1/2) of the Mobilization Payment upon satisfactory completion of the following:

1. Installation of any required field office(s).
2. Submission of all required insurance certificates and bonds.
3. Approval by the Department of Design and Construction of the coordinated progress schedule for the project and the Contractor's Shop Drawing schedule.

The remaining balance of the Mobilization Payment may be requisitioned only after 10 percent (10%) of the Contract price, exclusive of the total amount of Mobilization Payments made or to be made hereunder, shall have been approved for payment.

#### 1.04 Contract Drawings

- A. SCHEDULE C - The Contract Drawings are listed in Schedule C, which is set forth in the Addendum to the General Conditions. Such drawings referred to in the Contract, and in the applicable Specifications for the various Contracts bear the general title:

City of New York  
Department of Design and Construction  
Division of Structures

- B. DOCUMENTS FURNISHED TO THE CONTRACTOR - After the award of the Contract, the Contractor for General Construction Work will be furnished with five (5) sets of paper prints of all Contract Drawings mentioned in Paragraph A above.

- C. PRINTS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

Each Contractor, other than the Contractor for General Construction Work referred to in Paragraph B, will receive two (2) sets of paper prints of all Drawings listed in Paragraph A and three (3) sets of paper prints of all Contract Drawings applying directly to each Contractor's own Contract.

- D. Each Contractor will receive nine (9) complete sets of Specifications.
- E. ADDITIONAL COPIES of Drawings and Specifications, when requested, will be furnished to the Contractor if available.
- F. COORDINATION AND COOPERATION - Since the Contracts are all related to the project, the Contractor shall consult and study the requirement of the Contract Drawings and Specifications of all Contracts furnished to the Contractor, so that the Contractor may become acquainted with the work of the project as a whole in order to achieve the proper coordination and cooperation necessary for the efficient and timely performance of the work.
- G. SUPPLEMENTARY DRAWINGS - When, in the opinion of the Commissioner, it becomes necessary to more fully explain the work to be done, or to illustrate the work further, or to show any changes which may be required, drawings known as Supplementary Drawings will be prepared by the Commissioner.
- H. COMPENSATION - Where Supplementary Drawings entail extra work, compensation therefor to the Contractor shall be subject to the terms of the "Contract". The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings.



- I. SUPPLEMENTARY DRAWING PRINTS - Three (3) copies of prints of these Supplementary Drawings will be furnished to the Contractor.
- J. COPIES TO SUBCONTRACTORS - The Contractor shall furnish each of its subcontractors and material suppliers such copies of Contract Drawings, Supplementary Drawings, or copies of the Specifications as may be required for its work.
- K. CONTRACTOR TO CHECK DRAWINGS - The Contractor shall verify all dimensions, quantities and details shown on the Contract Drawings, Schedules, or other data received from the Commissioner, and shall notify the Commissioner of all errors, omissions, conflicts and discrepancies found therein. Notice of such errors shall be given before the Contractor proceeds with any work. Figures shall be used in preference to scale dimensions and large-scale drawings in preference to small-scale drawings.

#### **1.05 Shop Drawings and Record Drawings**

##### **A. SHOP DRAWINGS**

- 1. SUBMISSION OF SHOP DRAWINGS - For instructions relative to Shop Drawings involving electrical or mechanical work or equipment of any nature called for in any Contract, see the General Electrical Requirements and the General Mechanical Requirements.
- 2. SHOP DRAWINGS - The Contractor shall promptly prepare and submit layout detail and Shop Drawings of such parts of the work as are indicated in the Specifications or as required. These Shop Drawings shall be made in accordance with the Contract Drawings, Specifications and Supplementary Drawings, if any. The Shop Drawings shall be accurate and distinct and give all the dimensions required for the fabrication, erection and installation of the work.
- 3. SIZE OF DRAWINGS - The Shop Drawings, unless otherwise directed, shall preferably be on sheets of the same size as the Contract Drawings, with a one half (1/2) inch marginal space on each side and a two (2) inch marginal space for binding on the left side.
- 4. SCOPE OF DRAWINGS - Shop Drawings shall be numbered consecutively and shall accurately and distinctly represent the following:
  - a. All working and erection dimensions.
  - b. Arrangements and sectional views.
  - c. Necessary details, including performance characteristics, and complete information for making necessary connections with other work.
  - d. Kinds of materials including thicknesses and finishes.
  - e. All other information required by the Commissioner.
- 5. TITLES AND REFERENCE - Shop Drawings shall be dated and contain:
  - a. Name of the Project, DDC Project Number and Contract Number.
  - b. The descriptive names of equipment, or materials covered by the Contract Drawings and the classified item number or numbers, if any, under which it is, or they are required.
  - c. The locations or points at which materials, or equipment, are to be installed in the work.
  - d. Cross references to the section number, detail number and paragraph number of the Contract Specifications.

- e. Cross references to the sheet number, detail number, etc., of the Contract Drawings.

NOTE: In addition to the above requirements, the Shop Drawings shall bear a stamp having the following wording:

FIELD MEASUREMENTS - The Contractor certifies that it has verified and supplemented the Contract Drawings by taking all required field measurements, that said measurements correctly reflect all field conditions and that this Shop Drawing incorporates said measurements.

6. THE SUBMISSION OF SHOP DRAWINGS - The Shop Drawings shall be accompanied by a letter of transmittal, in triplicate, containing the name of the Project, the name of the Contractor, the number of Drawings, titles and any other requirements. Re-submission of the same drawings shall bear the original number of the drawings and the original titles.
7. PRELIMINARY SUBMISSION - The Contractor shall submit one (1) set of sepia Shop Drawings to the Consultant Architect/Engineer for their approval. A satisfactory Shop Drawing will be stamped "Approved", be dated and one (1) copy thereof will be returned to the Contractor by letter. Should the Shop Drawing not be approved by the Consultant Architect/Engineer, the Commissioner will return the sepia Shop Drawings with the necessary corrections and changes to be made as indicated thereon.
8. REVISIONS - The Contractor must make such corrections and changes and again submit one (1) set of sepia drawings for the approval of the Consultant Architect/Engineer. The Contractor shall revise and resubmit the Shop Drawing as required by the Consultant Architect/Engineer until approval thereof is obtained. However, Shop Drawings which have been stamped "Approved As Noted" shall be considered an "Approved" Shop Drawing and NEED NOT be revised and resubmitted.
- No work called for by the Shop Drawings shall be done until the approval of the said drawings by the Consultant Architect/Engineer is given. In addition to the foregoing Shop Drawing transmissions, a copy of any Shop Drawing prepared by any of the Contractors which Shop Drawing indicated work related to, adjacent to, impinging upon, or affecting work to be done by other Contractors, shall be transmitted to the Contractors so affected. These approved Shop Drawings shall be delivered to the Resident Engineer for distribution to the affected Contractors at the job meetings and shall be so recorded in the minutes.
9. FINAL SUBMISSION - When approval of any Shop Drawing is obtained by the Contractor, it shall insert the date of the approval of the drawing and promptly furnish the Consultant Architect/Engineer with eight (8) additional prints of the approved Drawings. No work called for by the Shop Drawings shall be performed until the approval of the said drawings by the Commissioner is given. In addition to the foregoing Shop Drawing transmissions, a copy of any Shop Drawing prepared by any of the Contractors which indicates work related to, adjacent to, impinging upon, or affecting work to be done by other Contractors, shall be transmitted to the Contractors so affected. These approved Shop Drawings shall be delivered to the Resident Engineer for distribution to the affected Contractors at the job meetings and shall be so recorded in the minutes.
10. VARIATIONS - If the Shop Drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in its letter of submittal. Approval of the Shop Drawings shall constitute approval of the subject matter thereof only and not of any structural apparatus shown or indicated.
11. CATALOGUE CUTS - Except as otherwise prescribed herein, the submission of catalogue cuts shall conform to the procedures specified for Shop Drawings.
- a. PRELIMINARY SUBMISSION - The Contractor shall submit three (3) sets of catalogue cuts to the Consultant Architect/Engineer to approve. A satisfactory catalogue cut will be stamped

"Approved", be dated and one (1) copy thereof will be returned to the Contractor by letter. Should the catalogue cut not be approved by the Commissioner, the Commissioner will return one (1) set of such catalogue cuts with the necessary corrections and changes to be made indicated thereon.

- b. REVISIONS - The Contractor shall make such corrections and changes and again submit four (4) sets of the catalogue cuts, in duplicate, for the approval of the Commissioner. The Contractor shall revise and resubmit the catalogue cuts as required by the Consultant Architect/Engineer until approval thereof is obtained.

However, catalogue cuts which have been stamped "Approved As Noted" shall be considered an "Approved" catalogue cut and need not be revised and resubmitted.

- c. FINAL SUBMISSION - When approval of any catalogue cut is obtained by the Contractor, it shall insert the date of the approval and promptly furnish the Consultant Architect/Engineer with four (4) additional sets of the approved catalogue cuts.

- 12. RESPONSIBILITY OF CONTRACTOR - The approval of Shop Drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such Shop Drawings, nor for the proper fitting and construction of the work, nor of the furnishing of materials or work required by the Contract and not indicated on the Shop Drawings. Approval of Shop Drawings shall not be construed as approving departures from the Contract Drawings, Supplementary Drawings or Specifications.

- 13. SHOP DRAWINGS AND MATERIAL SAMPLES SCHEDULE - The Shop Drawings and Material Samples Schedule is set forth in Schedule F, which is included in the Addendum to the General Conditions. Completion of this Schedule shall be in accordance with Article 1.41 (A) of these General Conditions.

- 14. PROCEDURE FOR PREPARING, FORWARDING, CHECKING AND RETURN - of all Shop Drawings shall be, generally, as follows:

The Contractor shall make available to its subcontractors the necessary Contract Documents and have them determine dimensions and conditions in the field, particularly with reference to coordination with other trades or work under other Contractors. The Contractor shall direct its subcontractors to prepare Shop Drawings for submission to the Consultant Architect/Engineer in accordance with the requirements of these General Conditions. The Contractor shall also direct its subcontractors to "Ring Up" corrections made on all re-submissions for approval, so as to be readily seen, and that the symbol "sub" be used to identify the source of the correction or information that has been added.

The Contractor shall:

- a. Review and be responsible to the Commissioner, or the Commissioner's authorized representative, for information shown on subcontractor's Shop and Installation drawings and manufacturers' date, and also for conformity to Contract Documents.
- b. "Ring Up" corrections made on all submissions for approval, so as to be readily seen, and that the symbol "GC", "PL", "HVAC" or "EL" be used to indicate that the correction and/or information added was made by the Contractor.
- c. Clearly designate which trade is to perform the work when the term, "work by others" or other similar phrases are indicated on the Contract Drawings before submission to the Consultant Architect/Engineer.
- d. Stamp submissions "Recommended for Approval", date and forward to the Commissioner or the Commissioner's authorized representative.

In order to expedite Shop Drawing procedures, the Contractor shall write a Shop Drawing status letter directly to the Consultant Architect/Engineer, each week, containing the following subject matter:

- (1) A list of all Shop Drawings which have been sent to but not returned by the Architect or Engineer giving name of the subcontractor, drawing number, title and date of submission.
- (2) An indication of the desired priority of the return, if necessary.

NOTE: The status letter shall be prepared and sent at a given time each week, preferably Friday afternoon, to enable the Consultant Architect/Engineer to receive the letter on Monday morning. This procedure shall be maintained throughout the active Shop Drawing period of construction.

**B. INTEGRATED DRAWINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. The Contractor for General Construction Work shall provide to the Contractor for Heating, Ventilating and Air Conditioning Work reflected ceiling starting points or plans, beam soffit elevations, ceiling heights, roof openings, etc.
2. The Contractor for Heating, Ventilating and Air Conditioning Work shall prepare a drawing or drawings showing ductwork, heating and sprinkler piping. This drawing shall include location of grilles, registers, etc. and access doors in hung ceilings. Locations shall be fixed by elevations and dimensions from column center lines and/or walls.
3. The Contractor for Heating, Ventilating and Air Conditioning Work shall prepare and distribute to each of the other Contractors, the Resident Engineer and to the Consultant Architect a sepia of the above.
4. The Contractor for General Construction Work shall lay out on its sepia, the reflected ceiling plan, beam soffit elevations, ceiling heights, roof openings, etc.
5. The Contractor for Plumbing Work shall lay out its piping, valves, cleanouts, etc., indicating locations and elevations and shall indicate the necessary access doors.
6. The Contractor for Electrical Work shall indicate its fixtures, large conduit runs, clearances, pull boxes, junction boxes, sound system speakers, etc.
7. The Resident Engineer will call as many meetings with the Contractors as are necessary to resolve any conflicts that become apparent. The Resident Engineer will call on the services of the Consultant Engineer or Architect where necessary. The Resident Engineer is responsible for the coordination of the Contract Drawings.
8. Upon resolution of the conflicts, each Contractor shall enter its own work on the Resident Engineer's sepia, which will become the Master or Integrated Drawing. The Master Sepia shall be signed by each Contractor to indicate its acceptance of the arrangement of the work.
9. A reproducible copy of the Master Integrated Drawing or Drawings will be prepared and distributed by the Contractor for Heating, Ventilating and Air Conditioning Work to each Contractor and to the Consultant Architect for information.
10. Each Contractor shall prepare its Shop Drawings in accordance with the Integrated Drawings. No work will be permitted without approved Shop Drawings. It is therefore essential that this procedure be instituted as quickly as possible.
11. Contractors shall be held strictly accountable for cooperation in preparing the Integrated Drawing or Drawings.

C. RECORD DRAWINGS

1. The Department of Design and Construction, at the start of construction (kick-off meeting), will furnish to each Contractor at no cost a complete set of Contract Document mylars pertaining to the work to be performed under its Contract. It is the responsibility of each Contractor to modify the Contract Drawings to indicate all changes and corrections, if any, occurring in the work as actually installed. The Contractor is required to furnish all other mylar drawings if necessary such as Addenda Drawings and Supplementary Drawings as may be necessary to indicate all work in detail as actually completed.

NOTE TO CONTRACTOR: All professional seals must be blocked out. Title box complete with project title and Consultants' names will remain.

2. Each Contractor shall maintain, during the progress of the work, an accurate record of the work as actually installed, on Record Drawings, on mylar, in ink. These Record Drawings shall be made available to the Resident Engineer upon request.

The Contractor's attention is particularly directed to the necessity of keeping accurate records of all subsurface and concealed work, so that the Record Drawings may contain this information in exact detail and location. Record Drawings should also show all connections, valves, gates, switches, cut-outs and similar operating equipment.

Before substantial completion payment, each Contractor shall furnish to the Commissioner one (1) complete set of mylar Record Drawings, in ink indicating all of the work and locations as actually installed, plus one (1) set of paper prints which will be furnished to sponsoring agency by Department of Design and Construction.

3. Record Drawings shall be of the same size as that of the Contract Drawings, with a one (1) inch margin on three (3) sides and a two (2) inch margin on the left side.
4. Each Record Drawing shall bear the legend "RECORD DRAWING" in heavy block lettering, one half (1/2) inch high, and contain the following data:

RECORD DRAWING

Contractor's Name \_\_\_\_\_

Contractor's Address \_\_\_\_\_

Made by \_\_\_\_\_ Date \_\_\_\_\_

Checked by \_\_\_\_\_ Date \_\_\_\_\_

Commissioner's Representatives

(Resident Engineer)	DDC
(Plumbing Inspector)	DDC
(Heating & Ventilating Inspector)	DDC
(Electrical Inspector)	DDC

5. RECORD DRAWING TITLE SHEET - Each Contractor shall prepare a title sheet, the same size as Record Drawings, which shall contain the following:

a. Heading:

The City of New York  
Department of Design and Construction  
Division of Structures

- b. Capital Budget Project Number (CAPIS ID)

- c. Name and Location of Project
  - d. Contractor's Name and Address
  - e. Record of changes (a caption description of work affected, and the date and number of Change Order or other authorization)
  - f. List of Record Drawings
6. All changes from Contract Drawings shall be distinctly encircled and identified by Change Order number correlating to changes listed on the "Title Sheet." The Contractor shall show within the encircled areas the work as actually installed.
  7. BULLETINS, OPERATING AND SERVICE MANUALS - Where the Contractor has submitted prints in the form of technical bulletins, operating and service manuals, or other printed matter as a Shop Drawing, having diagrams or drawings thereon of a material or equipment installed in the work, the Contractor shall furnish three (3) sets thereof so that the Commissioner may have all the necessary information for the proper operation maintenance and repair of the material and equipment and the ordering of spare parts. All bulletins and operating and service manuals shall be compiled and indexed in book form for each Contract.

#### **1.06 Approval of Materials**

- A. LOCAL LAWS - All materials, appliances and types or methods of construction shall be in accordance with the Specifications and shall in no event be less than that necessary to conform to the requirements of the Building Code of the City of New York, Administrative Code and Charter of the City of New York.
- B. APPROVAL OF MANUFACTURER - The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Commissioner for approval as early as possible to afford proper review and analysis.
- C. REPUTE OF MANUFACTURER - No manufacturer will be approved for any materials to be furnished under the Contract unless it shall be of good reputation, shall have a plant of ample capacity and shall have successfully produced similar products. All required approvals for legal use of materials and equipment such as B.S.A. and M.E.A. must be obtained prior to installation.
- D. ALL MATERIALS - fixtures, fittings, supplies and equipment furnished under the Contract shall be new and unused, except as approved by the Agency, and of standard first-grade quality and of the best workmanship and design. The City of New York encourages the use of recycled products where practical.
- E. INFORMATION TO SUPPLIERS - In asking for prices on materials under any item of the Contract, the Contractor shall provide the manufacturer or dealer with such complete information from the Specifications and Contract Drawings as may in any case be necessary, and in every case the Contractor shall inform the manufacturer or dealer of all the General Conditions and requirements herein contained.
- F. STANDARD REFERENCES - Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard.
- G. REFERENCES - Reference to a technical society, organization or body may be made in the Specifications by abbreviations in accordance with the following list:

A.I.A.                      for American Institute of Architects

A.C.I.	for American Concrete Institute
A.G.A.	for American Gas Association
A.G.M.A.	for American Gear Manufacturer Association
A.I.E.E.	for American Institute of Electrical Engineers
A.I.S.C.	for American Institute of Steel Construction
A.S.A.	for American Standards Association
A.S.T.M.	for American Society for Testing Materials
A.W.S.C.	for American Welding Society Code
A.W.W.A.	for American Water Works Association
B.S. & A.	for New York City Board of Standards & Appeals
C.I.P.R.A.	for Cast Iron Pipe Research Association
B.G. & E.	for Bureau of Gas & Electricity of the City of New York
FED. SPEC.	for Federal Specification
I.P.C.E.A.	for Insulated Power Cable Engineer's Association
NAVY SPEC.	for Navy Department Specification
N.E.C.	for National Electric Code
N.E.M.A.	for National Electrical Manufacturers Association
N.Y.B.C.	for New York City Building Code
N.Y.E.C.	for New York City Electrical Code
N.Y. SPEC.	for New York City Department of Purchase Specification
P.P.S.	for Power Piping Society
S.A.E.	for Society of Automotive Engineers Standards
S.H.B.I.	for Steel Heating Boiler Institute

- H. STANDARD SPECIFICATIONS - When no reference is made to a code, standard or specification, the Standard Specifications of the ASTM or the AIEE, as the case may be, shall govern.
- I. SAMPLES OF MATERIALS - The Contractor shall submit to the Commissioner for approval, samples of all materials specified to be used in the project.
1. For samples of materials involving electrical work of any nature, see the General Electrical Requirements.
  2. Samples shall be in triplicate, of sufficient size to show the quality, type, range of color, finish and texture of the material. However, in addition thereto, after approval, three (3) additional samples showing the material, color and texture of all interior finishes, including the finishes of exposed built-in equipment, trim, glazing, fittings and fixtures, etc., shall also be furnished. The sizes of these additional samples shall be as directed by and acceptable to the Commissioner.
  3. Each of the samples shall be labeled, bearing the name and quality of the material, the Contractor's name, date, Contract and project, and the related Specification or Contract Drawing reference to the samples submitted.
  4. A letter of transmittal, in triplicate, from the Contractor requesting approval must accompany all such samples.
  5. Transportation charges to the Commissioner's office must be prepared on all samples forwarded.
  6. Samples for testing purposes shall be as required in the Specifications.
- J. SAMPLES ON DISPLAY - When samples are specified to be equal to samples in the office of the Commissioner, they shall be carefully examined by the bidders and by those whom the bidder expects to employ for the furnishing of such materials.
- K. TIMELY SUBMISSIONS LOG/SCHEDULE - Samples shall be submitted in accordance with approved Shop Drawing log so as to permit proper consideration without delaying any operation under the project. Materials should not be ordered until approval is received, in writing, from the Commissioner. All materials shall be furnished equal in every respect to the approved samples.

- L. THE APPROVAL OF ANY SAMPLES - will be given as promptly as possible, and shall be only for the characteristic color, texture, strength, or other feature of the material named in such approval, and no other. When this approval is issued by the Commissioner, it is done with the distinct understanding that the materials to be furnished will fully and completely comply with the Specifications, the determination of which may be made at some later date by a laboratory test or by other procedure. Use of materials will be permitted only so long as the quality remains equal to the approved samples and complies in every respect with the Specifications, and the colors and textures of the samples on file in the Office of the Commissioner, for the project.
- M. ACCEPTIBILITY OF TEST DATA - The Commissioner will be the final judge as to acceptability of laboratory test data and performance in service of materials submitted.
- N. VALUABLE SAMPLES - such as hardware, plumbing and electrical fixtures, etc., not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the work after all questions of acceptability have been settled, providing suitable permanent records are made as to the location of the samples, their properties, etc.
- O. EQUIVALENT QUALITY OF MATERIALS - All materials and equipment which are designated in the Specifications by a number in the catalogue of any manufacturer or by a manufacturer's grade or trade name, are designated for the purpose of describing the article and fixing the standard or the quality and finish. Materials and equipment, which are, in the opinion of the Commissioner, the equivalent to that specified, will be acceptable.
- P. The submission of any material, or article, as the equal of the materials or articles set forth in the Specifications as a standard shall be accompanied by illustrations, drawings, descriptions, catalogues, records of tests, samples and any and all other information essential for judging the equality to the materials, finish and durability of that specified as standard, as well as information indicating satisfactory use under similar operating conditions.
- Q. MANUFACTURER'S DIRECTIONS - Where the Specifications provide that the manufacturer's directions are to be used, such printed directions shall be submitted to the Commissioner.
- R. COMMISSIONER TO SELECT INSPECTORS - Except as specifically provided in the Specifications, the Commissioner will select and designate all persons, firms, or corporations to make or witness each and every inspection, test or analyses, with or without reports.
- S. NOTICE - The Contractor shall give notice in writing to the Commissioner sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials, or the Commissioner will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or the Commissioner will notify the Contractor that inspection will be waived.
- T. NO SHIPPING BEFORE INSPECTION - The Contractor shall comply with the foregoing before shipping any material.
- U. CERTIFICATE OF MANUFACTURE - When the Commissioner so requires, the Contractor shall furnish to the Commissioner authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Specifications. These certificates shall include copies of the results of physical tests and chemical analyses where necessary, that have been made directly on the product, or on similar products being fabricated by the manufacturer. This may include such approvals as B.S.A., M.E.A., B.E.C. Advisory Board, etc.



- V. ACCEPTANCE - When materials or manufactured products shall comprise such quantity that it is not practical to make physical tests or chemical analyses directly on the product furnished, a certificate stating the results of such tests or analyses of similar materials which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for the acceptance of such material or manufactured product.
- W. TESTING COMPLIANCE - The testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Specifications, indicating thereon all analyses and/or test data and interpreted results thereof.
- X. REPORTS - Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Commissioner as prerequisite for the acceptance of any material or equipment.
- Y. REJECTIONS - If, in making any test, it is ascertained by the Commissioner that the material or equipment does not comply with the Specifications, the Contractor will be notified thereof, and will be directed to refrain from delivering said materials or equipment, or to promptly remove it from the site or from the work and replace it with acceptable material without cost to the City.
- Z. FURNISH DESIGNATED MATERIAL - Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Specifications, the Contractor shall immediately proceed to furnish the designated material or equipment.
- AA. COST OF TESTS BORNE BY CITY - Where the City directs test to be performed to determine compliance with the Specifications regarding materials or equipment, and where such compliance is ascertained as a result thereof, the City will bear the cost of such tests.
- BB. COST OF TESTS BORNE BY CONTRACTOR - Where tests are specifically called for in the Specifications to be made by the Contractor, the cost thereof shall be borne by the Contractor and shall be deemed to be included in the Contract price. The expenses of the testing personnel assigned by the City shall not be the Contractor's obligation. The Contractor shall reimburse the City for expenditures incurred in the making of tests on materials and equipment submitted by the Contractor as the equivalent of that specifically named in the Specifications and rejected for non-compliance.

#### **1.07 Delivery of Materials**

- A. MATERIAL ORDERS - The Contractor shall furnish to the Commissioner a copy of each material order, indicating date of order and quantity of material, and shall also notify the Commissioner when materials have been delivered to the site and in what quantities.
- B. AMPLE QUANTITIES - The Contractor shall deliver materials in ample quantities to insure the most prompt and uninterrupted progress of the work so as to complete the work within the Contract time.
- C. CONTAINERS - The manufacturer's containers shall be delivered with unbroken seals and shall bear proper labels.
- D. THE CONTRACTOR SHALL COORDINATE DELIVERIES - in order to avoid delaying or impeding the progress of the work of any related Contractor.
- E. STACKING - All materials shall be properly stacked in convenient places adjacent to the site, or where directed, and protected in a satisfactory manner. Stacked materials shall be so arranged as to not interfere with visibility of traffic control devices.
- F. OVERLOADING - If authority is given to store materials in any part of the project area, they shall be so stored as to cause no overloading.
- G. NO INTERFERENCE - If it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the work or interfering with the work to be done by any other Contractor, the relevant Contractor shall remove and restack such materials at no additional cost to the City.

## **1.08 Temporary Structures**

- A. **FIELD OFFICE FOR CONTRACTOR** - The Contractor shall establish a temporary field office for its own use at the site during the period of construction, at which readily accessible copies of all Contract Documents shall be kept.
- B. The field office shall be located where it will not interfere with the progress of any part of the work or with visibility of traffic control devices.
- C. **CONTRACTOR'S REPRESENTATIVE** - In charge of each office there shall be a responsible and competent representative of the Contractor, duly authorized to receive orders and directions and to put them into effect.
- D. **TELEPHONE ARRANGEMENTS** - Arrangements shall be made by the Contractor whereby its representative may be readily accessible by telephone.
- E. **MATERIAL SHEDS** - used by the Contractor for the storage of its materials shall be kept at locations which will not interfere at any time with the progress of any part of the work or with visibility of traffic control devices.
- F. **SUBSTANTIAL CONSTRUCTION** - All temporary structures shall be of substantial construction and neat appearance, and shall be painted a uniform gray unless otherwise directed by the Commissioner.
- G. **ADVERTISING PRIVILEGES** - The City reserves the right to all advertising privileges. The Contractor shall not cause any signs of any kind to be displayed at the site unless specifically required herein or authorized by the Commissioner.
- H. **CONTRACTOR'S SIGN** - The Contractor shall post and keep posted, on the outside of its field office, office or exterior fence or wall at site of work, a legible sign giving full name of the company, address of the company and telephone number(s) of responsible representative(s) of the firm who can be reached in event of an emergency at any time.

## **1.09 Surveys (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. **LINE AND GRADE** - The City will establish a baseline and bench mark near the site of the work for use of the Contractor in connection with the performance of the work.
- B. **RESPONSIBILITY** - The Contractor shall establish all other lines and elevations required for its work and shall be solely responsible for the accuracy thereof.
- C. **SAFEGUARD ALL POINTS** - Each Contractor shall safeguard all points, stakes, grade marks and bench marks made or established by the Contractor on the work, shall re-establish same if disturbed and bear the entire expense of rectifying the work improperly installed due to not maintaining, not protecting or removing without authorization such established points, stakes, or marks.
- D. **CITY MONUMENTS AND MARKS** - No work shall be performed near City monuments or marks so as to disturb them until the said monuments or marks have been referenced or reset or otherwise disposed of by the relevant Agency or party who installed them.
- E. **FOUNDATIONS** - The Contractor for General Construction Work shall furnish certification from a licensed Surveyor that all portions of the foundation work are located in accordance with the Contract Drawings and at the elevations required thereby. This certification shall show the actual locations and the actual elevations of all the work in relation to the locations and elevations shown on the Contract Drawings, including but not restricted to the following:
  - 1. The locations and elevations of all piles, if any.

2. Elevations of tops of all spread footings, tops of pile caps, and tops of all foundation walls, elevator pit walls and ramp walls.
  3. Location of all footing centers and pier centers including those for exterior wall columns.
  4. Location of all foundation walls including wall columns, elevator pit walls and ramp walls.
- F. **WALL LINES** - After the first courses of masonry or stone have been laid, the Contractor for General Construction Work shall establish the permanent lines of exterior walls. Such Contractor shall furnish promptly, certification from a licensed Surveyor, in the form of signed original drawings showing the exact location of such wall lines, of all portions of all structures. Except at its own risk, the Contractor for General Construction Work shall not proceed further with the erection of walls until the Surveyor's certification has been submitted and verified for correct location of wall lines.
- G. **SURVEYOR** - The Surveyor selected for any of the purposes mentioned in Paragraph E and Paragraph F above, and Paragraph I below, shall be a licensed Surveyor and shall be subject to the approval of the Commissioner. The Surveyor shall not be a regular employee of the Contractor, nor shall the Surveyor have any interest in the Contract. The Surveyor shall not be employed by the Contractor in laying out any work, it being intended that the Surveyor's certification shall represent an independent and disinterested verification of such layout. The Surveyor shall report to the Department of Design and Construction's Resident Engineer each time upon arrival to and departure from the site and review with the Resident Engineer the data required for the project.
- H. **FINAL CERTIFICATION** - Final certification shall be submitted upon completion of the work or upon completion of any subdivision of the work as directed by the Commissioner. Any exceptions or deviations from the drawings shall be noted on the final certificate and there shall be included any maps, plates, notes, pertinent documents and data necessary, in the opinion of the Commissioner, to constitute a full and complete report.
- I. **FINAL SURVEY** - The Contractor for General Construction Work shall submit to the Department of Design and Construction for submission to the Department of Buildings a final Survey by the licensed Surveyor showing the location of the new Structure, before completion of the Structure. This Survey shall show the location of the first tier of beams or of the first floor; the finish grades of the open spaces on the plot; the established curb level and the location of all other Structures on the plan, together with the location and boundaries of the lot or plot upon which the Structure is constructed, curb cuts, all yard dimensions, etc.

#### **1.10 Contractor's Superintendent**

- A. **SUPERINTENDENT** - The Contractor shall devote its time and personal attention to the work and shall employ and retain at the project site, from the commencement until the entire completion of the work, a Contractor's Superintendent competent and capable of maintaining proper supervision and care of the work and acceptable to the Commissioner, who, in the absence of the Contractor, and irrespective of any superintendent or foreman employed by any subcontractor, shall see that the instructions of the Commissioner are carried out.
- B. **REPLACEMENT** - The Contractor's Superintendent on the job shall not be changed or removed without the consent of the Commissioner.

#### **1.11 Permits**

The Contractor shall comply with all local, state and federal laws, rules and regulations affecting the Work of this Project, including, without limitation, (1) obtaining all necessary permits for the performance of the Work prior to commencement thereof, and (2) complying with all requirements for the disposal of demolition and/or construction debris, waste, etc., including disposal in City landfills. The Contractor shall be responsible for all costs in connection with such regulatory compliance, unless otherwise specified in the Contract.

### **1.12 Transportation**

- A. **AVAILABILITY** - It shall be the duty of the Contractor to determine the availability of transportation facilities and dockage for the use of its employees, equipment and material and the conditions under which such use will be permitted.
- B. **COSTS** - If transportation facilities and dockage are available and are permitted to be used by the governmental agency having jurisdiction, the Contractor shall pay all necessary costs and expenses, and abide by all rules and regulations promulgated in connection therewith.
- C. **VEHICLES** - With respect to the use of vehicles on highways and bridges, the Contractor's attention is directed to the limitations set forth in the Rules of the City of New York, Title 34, Chapter 4, Section 4-15.
- D. **CONTINUED USE** - It is understood that the Commissioner makes no warranty as to the continued use by the Contractor of such facilities.

### **1.13 Sleeves And Hangers (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. **COORDINATE TO PROGRESS SCHEDULE** - Contractors required to furnish and install conduits, outlets, piping sleeves, boxes, inserts and all other materials and equipment necessary to be built into the work to be performed by the Contractor for General Construction Work, shall promptly furnish and set such sleeves or other materials in conformity with the requirements of the project.
- B. **COOPERATION OF CONTRACTORS** - All Contractors shall fully cooperate with each other in connection with the performance of the above work as "cutting in" new work is neither contemplated nor will it be tolerated.
- C. **TIMELINESS** - In the event that timely delivery of sleeves and other materials cannot be made, and to avoid delay, the affected Contractor may arrange to have boxes or other forms set at the locations where the piping or other material is to pass through or into the slabs, walls or other work. Upon the subsequent installation of the sleeves or other material, the Contractor for General Construction Work shall fill around them with materials as required by the Contract. The necessary expenditures incurred for the boxing out and filling in shall be borne by the Contractor or Contractors responsible therefore.
- D. **INSERTS** - The Contractor for General Construction Work is to install strip inserts four (4) foot on center and perpendicular to beams in ceiling slabs of boiler, machine and mechanical equipment rooms. Inserts are to be installed for strippable concrete slabs only.

### **1.14 Cutting And Patching**

- A. **RESPONSIBILITY** - Each Contractor shall do all cutting, patching and restoration required by its work, unless otherwise particularly specified in the Specifications of its Contract.
- B. **RESTORE WORK** - Each Contractor shall restore any work they damage that is the work of another Contractor.
- C. **COMPETENT WORKERS** - All restoration work shall be done to the satisfaction of the Commissioner by competent workers skilled in the trade required by such restoration. If, in the judgment of the Commissioner, workers engaged in restoration work are incompetent, they shall be replaced immediately by competent workers.
- D. **REMOVALS** - Each Contractor must remove from the premises all demolished materials of every nature or description resulting from cutting, patching and restoration work, in accordance with the requirements hereinafter stipulated under article on REMOVAL OF RUBBISH AND SURPLUS MATERIALS.

**1.15 Temporary Heat (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

**A. GENERAL**

1. Definition - The provision of Temporary Heat shall mean the provision of heat in order to permit construction to be performed in accordance with the Progress Schedule during all seasons of the year and to protect the work from the harmful effects of low temperature. In the event the building, or any portion thereof, is occupied during construction, the provision of Temporary Heat shall include the provision of heat to permit normal operations in such occupied areas.
  - a. The provision of Temporary Heat shall be in accordance with the temperature requirements set forth in Paragraph (c) below.
  - b. The provision of Temporary Heat shall include the provision of: 1) all fuel necessary and required, 2) all equipment necessary and required, and 3) all operating labor necessary and required. Operating labor shall mean that minimum force required for the safe day to day operation of the system for the provision of Temporary Heat and shall include, without limitation, heating maintenance labor and/or Firewatch as required by NYC Fire Department regulations. Operating labor may be required seven (7) days per week and during other than normal working hours, for the period of time required by seasonal weather conditions.
  - c. In the event the building, or any portion thereof, is occupied and the Project involves the replacement, modification and/or shut down of the permanent heating system, or any key component thereof; and such system is a combined system which furnishes domestic hot water for the building occupants, the provision of Temporary Heat shall include the provision of domestic hot water at the same temperature as the system which is being replaced. Domestic hot water shall be provided in accordance with the phasing requirements set forth in the Contract Documents.
2. Responsibility – The Contractor responsible for the provision of Temporary Heat, and all expenses in connection therewith, shall be as set forth below.
  - a. Projects Involving Enclosure of the Building
    - (1) Prior to Enclosure - Until the Commissioner determines that the building has been enclosed, as set forth in Paragraph (b) below, each Contractor shall be responsible for the provision of its own Temporary Heat.
    - (2) Post Enclosure - Once the Commissioner determines that the building, or any portion thereof, has been enclosed, as set forth in Paragraph B below, the Contractor for Heating, Ventilating and Air Conditioning Work ("HVAC Work") shall be responsible for the provision of Temporary Heat by one or more of the following means: 1) by an existing heating system (if any), 2) by a permanent heating system which is being installed as part of the Project, or 3) by a temporary heating system(s). The Contractor for HVAC Work shall, within two (2) weeks of the kick-off meeting, submit to DDC for review its proposed plan to provide Temporary Heat. Such plan is subject to approval by the Resident Engineer. The Contractor for HVAC Work shall provide Temporary Heat in accordance with the approved plan until written acceptance by the Commissioner of the work of all Contractors, including punch list work, unless directed otherwise in writing by the Commissioner. The responsibility of the Contractor for HVAC Work provided for herein is subject to the exception set forth in Paragraph H.3.b.(2) below.
  - b. Projects not involving Enclosure of the Building
    - (1) If the Project involves the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing

permanent heating system, or any key component thereof, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat, except as otherwise provided in Paragraph H.3.b.(2) below.

- (2) If the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof; there is no Contractor responsibility of the provision of Temporary Heat, unless otherwise specified in the Contract Documents. However, if the Commissioner, pursuant to Paragraph H.3.b.(1) below, determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat and such Contractor shall be paid for the same in accordance with Paragraph H.3.b.(1).

## B. ENCLOSURE OF STRUCTURES

1. Notification - The Contractor for General Construction Work shall notify all other Contractors and the Resident Engineer at least 30 days prior to the anticipated date that the building(s) will be enclosed.
2. Commissioner Determination - The Commissioner shall determine whether the building, or any portion thereof, has been enclosed. As indicated in Paragraph A above, once the building has been enclosed, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat. The Commissioner's determination with respect to building enclosure shall be based upon all relevant facts and circumstances, including without limitation, 1) whether the building meets the criteria set forth in Paragraph 3 below, and 2) whether the openings in the building, such as doorways and windows, have been sufficiently covered so as to provide reasonable heat retention and protection from the elements.
3. Criteria for enclosure
  - a. Roof Area
    - (1) A building shall be considered to be roofed when the area to be roofed is covered by a permanent structure and all openings through the permanent structure are covered and protected by temporary covers in Paragraph (c) below.
    - (2) Intermediate floor structures of multi-floor buildings shall be considered to be roofed subject to the same requirements of the building roof.
    - (3) The final roofing system need not be in place for the building or structure to be determined to be enclosed; provided, however, all openings through the permanent structure covering the roof must be covered and protected by temporary covers, as described in Paragraph (c) below.
  - b. Walls - For the walls to be determined to be enclosed, permanent exterior wall elements or facing material must be in place and all openings must be covered and protected by temporary covers, as described in Paragraph (c) below.
  - c. Temporary Covers - In order to be acceptable, temporary covers must be securely fixed to prevent the entrance of rain, snow and direct wind. The minimum material requirements for temporary covers are as follows: 1) minimum 10 mil. plastic, 2) minimum 12 ounce waterproof canvas tarpaulins, or 3) a minimum three-eighths (3/8) inch thickness exterior grade plywood.
  - d. Temporary covers for openings shall be the responsibility of the Contractor for General Construction Work, and such work shall be deemed included in the Contractor for General Construction Work's bid price.

C. TEMPERATURE REQUIREMENTS

1. Unoccupied Buildings - The temperature requirement for the provision of Temporary Heat in unoccupied buildings shall be the GREATER of the following: 1) 50 degrees Fahrenheit, or 2) the temperature requirement for the particular type of work set forth in the Contract Documents.
2. Occupied Buildings - The temperature requirement for the provision of Temporary Heat in occupied buildings, or portions thereof, shall be the GREATER of the following: 68 degrees Fahrenheit or the temperature requirement for the particular type of work set forth in the Contract Documents.

D. DURATION

1. The Contractor for HVAC Work shall be required to provide Temporary Heat until written acceptance by the Commissioner of the work of all Contractors, including punch list work, unless directed otherwise in writing by the Commissioner. The Contractor for HVAC Work shall be responsible for the provision of Temporary Heat for the time specified herein, regardless of any delays in completion of the Project, including delays that result in the commencement of the provision of Temporary Heat during a season that is later than that which may have been originally anticipated. The Contractor for HVAC Work shall include in its Total Bid Price all expenses in connection with the provision of Temporary Heat in accordance with the requirements specified herein.
2. The total Contract duration is set forth in consecutive calendar days in Schedule A of the General Conditions. The Table set forth below indicates the number of full heating seasons that are deemed included in various contract durations, which are specified in consecutive calendar days (ccds). At a minimum, a full heating season shall extend from October 15<sup>th</sup> to April 15<sup>th</sup>.

Contract Duration	Full Heating Seasons Required
up to 360 ccds	1 full heating season
360 to 720 ccds	2 full heating seasons
more than 720 ccds	3 full heating seasons

E. METHOD OF TEMPORARY HEAT

1. The method of temporary heat shall be in conformance with all applicable laws, rules and regulations. Prior to implementation, such method shall be subject to the written approval of the Commissioner.
2. The method of temporary heat shall:
  - a. Not cause the deposition of dirt or smudges upon any finished work or cause any defacement or discoloration to the finished work.
  - b. Not be injurious or harmful to people or materials.
3. No open fires will be permitted.
4. Electric heating will not be permitted unless required by Contract Documents and Specifications or otherwise approved by the Commissioner.
5. Direct-fired equipment will be allowed in construction areas where the use of such equipment will not damage or deteriorate the construction or finishes or be harmful to persons working in the area.

F. TEMPORARY HEATING SYSTEM

1. The temporary system for the provision of Temporary Heat provided by the Contractor for HVAC

Work following enclosure of the building shall be complete including, but not limited to, torpedo blowers and/or propane heaters subject to provisions of paragraph E above), boilers and fuel storage, pumps, radiators, unit heaters, water and heating piping, insulation and controls. The temporary system for the provision of Temporary Heat shall be capable of maintaining the minimum temperature requirements set forth in Paragraph C above.

G. THE CONTRACTOR FOR GENERAL CONSTRUCTION WORK

1. The Contractor for General Construction Work shall coordinate with the Contractor for HVAC Work in the work of providing Temporary Heat, and shall so coordinate its operations as to insure sufficient and timely performance of the work under all Contracts. The Contractor for General Construction Work shall supply and pay for all water required and used in the building for the operation of the heating system(s) for the purpose of Temporary Heat. The Contractor for General Construction Work shall include all expenses in connection with the supply of water for Temporary Heat in its Total Bid Price. During the period in which Temporary Heat in an enclosed building is being furnished and maintained by the Contractor for HVAC Work, the Contractor for General Construction Work shall, in order to provide proper ventilating and drying, open and close the windows and other openings when necessary for the proper execution of the work and also when directed by DDC. The Contractor for General Construction Work shall maintain all permanent or temporary enclosures at its own expense.

H. THE CONTRACTOR FOR HVAC WORK

1. Use of Permanent Heating System for Temporary Heat after Building Enclosure
  - a. The Contractor for HVAC Work shall provide all labor and materials to promptly furnish and set all required equipment and convectors and/or radiators, piping, valves, fitting, etc., in ample time for their use for the provision of Temporary Heat after enclosure of the building.
  - b. New portions of the permanent heating system that are used for furnishing Temporary Heat shall be left in near perfect condition when delivered to the City for operation. Any repairs required, other than for ordinary wear and tear on the equipment, shall be made by the Contractor for HVAC Work at his expense. The starting date for the warranty or guarantee period for such equipment shall be the date of Substantial Completion acceptance.
  - c. In the event that the Contractor for HVAC Work does not advance the installation of the permanent heating system in sufficient time to permit its use for Temporary Heat as determined by DDC, the Contractor for HVAC Work shall furnish and install a separate system for the provision of Temporary Heat as required to maintain the minimum temperature requirements set forth in Paragraph C above.
2. All equipment for the system for the provision of Temporary Heat shall be placed so as to comply with the requirements specified hereinbefore, and shall be connected, disconnected and suitably supported and located so as to permit construction work, including finish work such as wall plastering and painting, to proceed. The installation of the system for the provision of Temporary Heat by the Contractor for HVAC Work, including the placing of ancillary system equipment, shall be coordinated with the operations of all Contractors so as to insure sufficient and timely performance of the work of all Contractors. Once the permanent heating system is operating properly, the Contractor for HVAC Work shall remove all portions of the system for Temporary Heat which are not part of the permanent heating system.
3. Temporary Heat Allowance for Special Conditions or and/or Unforeseen Circumstances.
  - a. The City has established an allowance in the Contract for HVAC Work for payment of costs and expenses in connection with the provision of Temporary Heat as set forth herein. The amount of such allowance is set forth on the Bid Form for the Contract for HVAC Work and shall be included in the Total Bid Price of the Contractor for HVAC Work. The Contractor for HVAC Work shall only be entitled to payment from this allowance under the conditions and in



accordance with the requirements set forth below. In the event this allowance or any portion thereof remains unexpended at the conclusion of the Contract, such allowance shall remain the sole property of the City. Should the amount of the allowance be insufficient to provide payment for the expenses specified below, the City will increase the amount of the allowance.

b. The allowance set forth herein may be utilized only under the conditions set forth below.

- (1) In the event the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof, and the Commissioner determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat, as directed by the Commissioner. The City shall pay such Contractor for all costs for labor, material, and equipment necessary and required for the same. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.
- (2) In the event that after enclosure of the building, the Commissioner determines that (i) Contractors other than the Contractor for HVAC Work have not sufficiently advanced the work of their contracts that is necessary and required to permit the Contractor for HVAC Work to use the permanent or other heating equipment for the provision of Temporary Heat, and (ii) the Contractor for HVAC Work does not bear any responsibility for such other Contractors' failure to advance the work, the City shall pay the Contractor for HVAC Work for all differential costs for labor, material, and equipment necessary and required for the provision of a substitute system(s) for the provision of Temporary Heat or portions thereof in lieu of the permanent or other systems intended for Temporary Heat. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.
- (3) In the event the Commissioner determines that there is a need for maintenance of the permanent heating system by the Contractor for HVAC Work after written acceptance by the Commissioner of the work of all Contractors, and that the need for such maintenance is not the fault of the Contractor for HVAC Work, the Contractor for HVAC Work shall provide the required maintenance of the permanent heating system for the period of time directed by the Commissioner. The City shall pay the Contractor for HVAC Work for the cost of direct labor and fuel necessary and required in connection with such maintenance, excluding the cost of any foremen or other supervision. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.

- c. Payment for Fuel Costs - Payment from the allowance set forth herein for the cost of fuel necessary and required to operate the system for the provision of Temporary Heat or to maintain the permanent heating system under the conditions set forth in Paragraph b above shall be limited to the direct cost of such fuel. The Contractor for HVAC Work shall not be entitled to any overhead and/or profit for such fuel costs. In order to receive payment for such fuel costs, the Contractor for HVAC Work must present original invoices for the same. DDC reserves the right to furnish the required fuel.
- d. Deduction - In the event that any amount of the allowance set forth herein is expended for payment to the Contractor for HVAC Work under the circumstances set forth in Paragraph b.(2) above, the Commissioner shall deduct and retain such amount out of moneys that are due and owing hereunder to the other Contractor(s) responsible for the failure to advance the work, as determined by the Commissioner. In the event the amount expended from the allowance exceeds the total sum due and owing to such other Contractor(s), such excess shall be paid to the City by such other Contractor(s) immediately upon demand.

#### I. THE CONTRACTOR FOR ELECTRICAL WORK

1. The Contractor for Electrical Work shall be responsible for providing the items set forth below and shall include all expenses in connection with such items in its Total Bid Price. The Contractor for Electrical Work shall provide such items promptly when required and shall in all respects coordinate its work with the Contractor for General Construction Work and the Contractor for HVAC Work in order to facilitate the provision of Temporary Heat by the Contractor for HVAC Work.
  - a. The Contractor for Electrical Work shall provide all labor, materials, equipment and power necessary and required to furnish and maintain any temporary or permanent electrical connections to all equipment specified to be connected as part of the work of his Contract.
  - b. The Contractor for Electrical Work shall supply and pay for all power necessary and required for the operation of the system for the provision of Temporary Heat and/or the permanent heating system used for Temporary Heat by the Contractor for HVAC Work. Such power shall be provided by the Contractor for Electrical Work for the duration the Contractor for HVAC Work is required to provide Temporary Heat, as set forth in Paragraph D above.
2. In providing the items set forth in Paragraph 1 above, the Contractor for Electrical Work is advised that labor may be required seven (7) days a week and/or during other than normal working hours for the period of time required by seasonal weather conditions.

**J. THE CONTRACTOR FOR PLUMBING WORK**

1. The Contractor for Plumbing Work shall be responsible for providing all labor, materials and equipment necessary and required to furnish and maintain all temporary or permanent connections to all equipment or plumbing outlets specified to be provided as part of the work of his Contract. The Contractor for Plumbing Work shall include all expenses in connection with such items of work in its Total Bid Price. The Contractor for Plumbing Work shall provide such items of work promptly when required and shall in all respects coordinate its work with the Contractor for General Construction Work and the Contractor for HVAC Work in order to facilitate the provision of Temporary Heat by the Contractor for HVAC Work.
2. In the event portions of the permanent plumbing equipment furnished by the Contractor for Plumbing Work as part of the work of his Contract are used for the provision of Temporary Heat by the Contractor for HVAC Work, either during construction or prior to acceptance by the City of the complete plumbing system, the Contractor for Plumbing Work shall be responsible to provide such plumbing equipment to the City in near perfect condition and shall make any repairs required, other than for ordinary wear and tear on the equipment, at his expense. The starting date for warranty and/or guarantee period for such plumbing equipment shall be the date of Substantial Completion acceptance by the City.
3. For Projects requiring the installation of new and/or modified gas service, as well as associated meter installations, the Contractor for Plumbing Work shall promptly perform all required filings and coordination with the Utility Companies in order to expedite the installation, testing, and approval of the gas service and associated meter(s).

**1.16 Scaffolding and Platforms**

- A. CONFORMANCE: Unless otherwise indicated, the Contractor for General Construction is responsible for providing, erecting, installing and maintaining all temporary scaffolding and platforms which shall comply with requirements of Chapter 33 (Safeguards During Construction or Demolition) of the NYC Building Code, NYC Local Law 52 of 2005, OSHA Construction Standard 1926 Subpart L, and furnishing the following items.
- B. RESPONSIBILITY
  1. A Jobsite Monitor who shall be a competent person, designated and employed by the contractor who has a daily presence on the site during scaffold use. This designee must possess and

maintain a valid New York City Department of Buildings supported scaffold certificate of completion. An alternate shall also be designated, in the event that the Jobsite Monitor is absent. The Jobsite Monitor shall:

- a. Verify completeness of documentation and submittals (as described below).
  - b. Verify that inspections are performed, including pull tests (see below), reports are filed and reported deficiencies are corrected.
  - c. Monitor trades using scaffold.
  - d. Limit access to scaffold areas that are tagged for non-use.
  - e. Inform trades of scaffold load limitations.
  - f. Monitor loading of decks.
  - g. Verify that any ties that are temporarily removed are properly restored in the same shift.
  - h. Verify that outriggers and planks that are moved are properly set up and secured.
  - i. Verify that all scaffold decks in use have proper access/egress.
  - j. Verify that all open sides of decks in excess of 14 inches have proper guardrails and toe-boards.
  - k. Notify appropriate parties, including but not limited to the Resident Engineer, site safety coordinator / monitor, site safety consultant, scaffold users, contractor and the scaffold engineer, of misuses, non-conformances, hazards and accidents.
  - l. Keep a log of significant actions and events connected with the scaffolding.
2. The Contractor shall be responsible for erection, maintenance and dismantling of the scaffold / shed in conformance with the New York City Building Code and OSHA requirements, contract documents and engineering specifications. The Contractor shall also be guided by generally accepted standards of scaffold industry practice as promulgated by the Scaffold Industry Association.
  3. Scaffold Engineer is a New York State licensed PE engaged by the scaffold contractor / erector and responsible to ensure that the installation design conforms to the New York City Building Code and OSHA requirements, that the design comports with the capabilities of the components and the characteristics of the site, that scaffold loads on the host building, including netting, have been properly considered and that the design documents communicate information for erectors and users.
  4. Scaffold users are trade contractors assigned to work on the scaffold. Training certificates from a New York City Department of Buildings approved training provider are mandatory. These users have the duty to become familiar with the New York City Building Code and OSHA requirements germane to users, to obey the instructions of the Jobsite Monitor and inform the Jobsite Monitor of known hazards, non-conformances or violations.

C. JOBSITE DOCUMENTATION AND SUBMITTALS:

1. NYC Department of Buildings permit(s) for scaffold and side walk sheds (as applicable) including filing applications signed and sealed by A Professional Engineer licensed in the State of New York;
2. Site logistics plan / site safety plan;
3. Installation drawing(s), design and product data to be provided for all scaffold(s) and shed(s) must include, at a minimum:
  - a. Plan(s);
  - b. Elevation(s);
  - c. Duty load designation; "standard" (150 psf live load) or "heavy duty" (300 psf live load).
  - d. Details including base support, anchors and ties;
  - e. Notes and specifications including load limits, number of planked levels, tie spacing, netting, and sequence of installation and removal.
  - f. Anchorage into sound material.
  - g. Load limits based on pull tests;
  - h. Specifications for pull test(s), method, proof load and the number of trials;
  - i. Elevations, levels or heights, where anchorage is made into masonry;

- j. Specifications for frames, planks, screw jacks, anchors, and any other ancillary hardware;
- k. Samples for anchors, ties and netting;
- l. Sequence of operations for erection and demolition;
- m. Location plan, heights, widths, "jumps" over doorways and driveways;
- n. Specify size, maximum span and maximum spacing of headers and stringers;
- o. Specify legs, girts, braces, nailing and connections;
- p. All sidewalk sheds shall be designed, engineered, signed and sealed by a Professional Engineer licensed in the State of New York;
  - 1) Generic (not job specific) engineering drawings are satisfactory for standard sheds and arrangements.
  - 2) Special engineering is required for custom sheds, site-specific problems or non-standard arrangements.

**D. INSPECTIONS:**

- 1. Signed inspection reports shall be issued for each inspection and pull-test below, and shall be logged and maintained on site by the Jobsite Monitor for the duration of the project.
- 2. Pull testing shall be required during design, and during or post erection, where anchorage is made into masonry. The Scaffold Engineer shall specify the test method, proof load and the number of trials.
- 3. Sidewalk sheds shall be inspected after initial installation, major modification, or damage and thence every three months. Inspections shall be by a Scaffold Engineer for custom sheds and by a competent person employed by the Contractor for standard sheds.
- 4. Scaffolds shall be inspected by the Scaffold Engineer during erection, post-erection and prior to use and thence every three months. The Scaffold Engineer shall repeat inspections after major alteration/modification, damage.
- 5. A qualified person assigned by the Contractor shall inspect the progress of erection and dismantling, and the condition and integrity of the sidewalk sheds after high winds, major storms and at least once per month during usage.
- 6. A qualified person assigned by the Contractor shall inspect the progress of erection and dismantling at least weekly, and the condition and integrity of the scaffold after high winds, major storms and at least once per month during usage.
- 7. Scaffolds shall be inspected daily by the Jobsite Monitor or alternate prior to use by scaffold users.
- 8. At the completion of the project, submit all inspection documents to the Commissioner for record purposes.

**E. LADDERS AND STAIRS:** The Contractor for General Construction Work shall provide and maintain ladders or temporary stairs extending from the street to the first story, and to and from every floor and roof level of the project.

**F. ACCESS AND EXITS:** The ladders or temporary stairs shall be of acceptable size, number and location, so that proper and convenient access may be had by those required to proceed to and from all parts of the project.

**1.17 Hoists and Hoistways**

**A. RESPONSIBILITY -** The Contractor for General Construction Work shall provide adequate numbers of material hoists for the most expeditious performance of all parts of its work. All other Contractors are required to provide their own facilities for the hoisting of materials under their respective Contracts. However, these Contractors may make arrangements, whenever possible, with the Contractor for General Construction Work for the use of its hoist upon such terms and conditions as it may prescribe.

- B. LOCATIONS - No hoists shall be constructed at such locations as will interfere with, or affect the construction of, floor arches, or the work of other Contractors. The hoists may be located at the exterior sides of the structure or in the courtyard and extend upward adjacent to the line of window openings. The hoists shall be located a sufficient distance from the exterior walls and be so protected as to prevent any of the permanent work from being damaged, stained or marred.
- C. ELEVATOR SHAFT - Wherever possible, one or more of the permanent elevator shafts may be used as temporary hoistways providing such use meets with the Building Code of the City of New York and the approval of the Commissioner, and providing further it entails no interference with the progress of the work of any Contractor.
- D. PROTECTION FOR INTERIOR HOISTS - All interior material hoistways shall be enclosed on each floor and shall be adequately protected with appropriate safety guards. In no event shall the protection be less than that required by law.

#### **1.18 Certificates of Approval**

- A. RESPONSIBILITY - Each Contractor shall be responsible for and shall obtain all final approvals for the work installed under its Contract in the form of such certificates that are required by all governmental agencies having jurisdiction over the work of the Contract.
- B. TRANSMITTAL - All such certificates shall be forwarded to the Commissioner through the Resident Engineer before final acceptance of the work of the Contract.

#### **1.19 Acceptance Tests**

- A. GOVERNMENTAL AGENCIES - All equipment and appliances furnished and installed under the Contract shall conform with the requirements of the Specifications, and shall in no event be less than that necessary to comply with the minimum requirements of the law and all of the governmental agencies having jurisdiction.
- B. NOTICE OF TEST - Whenever the Specifications and/or any governmental agency having jurisdiction requires the acceptance test, the Contractor shall give written notice to all concerned of the time when these tests will be conducted.
- C. ENERGY - The City will furnish all energy, fuel, water and light required for tests.
- D. LABOR AND MATERIALS - The Contractor shall furnish labor and all other material and instruments necessary to conduct the acceptance tests at no additional cost to the City.
- E. CERTIFICATES - The final acceptance by the Commissioner shall be contingent upon the Contractor delivering to the Commissioner all necessary certificates evidencing compliance in every respect with the requirements of the regulatory agencies having jurisdiction.
- F. RESULTS - If the results of tests and Controlled Inspections indicate that the material or procedures do not meet requirements as set forth on the Contract Drawings or in the Specifications or are otherwise unsatisfactory, the Contractor shall only proceed as directed by the Resident Engineer. Additional costs resulting from retesting, reinspecting, replacing of material and/or damage to the work of other trades and any delay caused to the schedule shall be borne by the Contractor.

#### **1.20 Progress Photographs (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. PHOTOGRAPHER - The Contractor for General Construction Work shall employ and pay for the services of a competent photographer who shall take photographs showing the progress of the work.
- B. PHOTOGRAPHS - There shall be four (4) photographs taken each month from the commencement of the Contract to the time of completion. These photographs shall show as far as possible, the work

completed within and on the exterior of the structure. The first series of photographs shall be taken prior to the actual commencement of work at the site. In addition thereto before final payment, there shall be six (6) photographs taken of unobstructed views of the completed project or projects and site, as directed by the Commissioner and after all scaffolding, hoists, shanties, field offices or other temporary work has been removed and final cleaning done. (For demolition work included in the Contract there shall be four (4) photographs taken before commencement of demolition operations; four (4) at the mid-point of operations; and four (4) at the completion of demolition operations). The prints shall be 8" x 10" gloss finish, mounted with a one (1) inch binding flap of muslin on the left side. They shall be marked on the back with date of exposure; the title of the project; and the specific location. Three (3) copies of each photograph shall be furnished free of charge to the Department of Design and Construction. Photographs shall be taken as ordered by the Commissioner.

#### **1.21 Job Meetings**

- A. **MEETINGS SCHEDULE** - Meetings shall be held as scheduled by the Resident Engineer in his office at the site, at which time Contractors for all separate Contracts shall have their representatives present to discuss all details relative to the execution of the work.
- B. **ACCOMMODATIONS** - The Contractor for General Construction Work shall provide ample tables and chairs to accommodate all present at the meetings, and table space for Contract Drawings.
- C. **AGENDA** - The Resident Engineer shall preside over these meetings. Prior to each meeting, the Resident Engineer will consult with the Contractors and will prepare an agenda of items to be discussed. In general, after informal discussion of any item on the agenda, the Resident Engineer will summarize the discussion in a brief written statement, and each Contractor will then dictate a brief statement for the record.

The Contractor for General Construction Work shall furnish all necessary typing and printing of the minutes prepared by the Consultant Architect/Engineer. Ample copies of the printed minutes shall be furnished to the Resident Engineer for distribution to all Contractors and representatives of the Commissioner.

- D. **COORDINATION** - Job meetings shall also be called by the Contractor for General Construction Work for the purpose of coordinating, expediting and scheduling the work of all Contracts in accordance with the master coordinated Job Progress Chart. All Contractors and their subcontractors, material suppliers or vendors whose presence is necessary, are required to attend. These meetings may, at the discretion of the Contractor for General Construction Work, be held at the same place and immediately following the Job Meetings held by the Resident Engineer. Minutes of these meetings shall be recorded, typed and printed by the Contractor for General Construction Work and distributed to all parties concerned.

#### **1.22 Guarantees and Warranties - Refer to the Addendum to the General Conditions for the applicability of this article.**

- A. **SCHEDULE B** - Requirements for guarantees and warranties for the Project are set forth in Schedule B, which is included as part of the Addendum to the General Conditions.
- B. **FORM** - For all guarantee requirements set forth in Schedule B, the Contractor shall provide a written guaranty, in the form set forth on the following page.

## GUARANTY

DDC PROJECT # \_\_\_\_\_

PROJECT DESCRIPTION \_\_\_\_\_

CONTRACT # \_\_\_\_\_

SPECIFICATION SECTION # AND TITLE \_\_\_\_\_

GUARANTY TO BE IN EFFECT FROM \_\_\_\_\_

TO \_\_\_\_\_

The Contractor hereby guarantees that the work specified under the above section of the aforesaid Contract will be free from defects of material and/or workmanship, for the period indicated above.

The Contractor also guarantees that it will promptly repair, restore, rebuild or replace whichever may be deemed necessary by the City, any or all defective material or workmanship of the aforementioned section, that may appear within the guaranty period and any finished work to which damage may occur because of such defects, to the satisfaction of the City and without any cost or expense to the City.

The Contractor hereby agrees to pay to the City the cost of the repairs or replacements should the City make the same because of the failure of the Contractor to do so.

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
By

Subscribed and sworn to before me this

day of \_\_\_\_\_, year \_\_\_\_\_

\_\_\_\_\_  
Notary Public

### **1.23 Removal of Rubbish and Surplus Materials**

- A. RUBBISH - Rubbish shall not be thrown from the windows or other parts of the project. Mason's rubbish, dirt and other dust-producing material shall be wetted down periodically.
- B. LOCATION - Each Contractor shall sweep up and deposit, at a location designated on each floor by the Contractor for General Construction Work, all of its rubbish, debris and waste materials, as it accumulates and when directed by the Resident Engineer. Wood cratings shall be broken up, neatly bundled, tied and stacked ready for removal and be deposited at a location designated on each floor by the Contractor for General Construction Work.
- C. LABORERS - The Contractor for General Construction Work shall be responsible for the removal of all rubbish, etc., from the site. The Contractor shall remove from the designated locations all piles of rubbish, debris, waste material and wood cratings as they accumulate and when directed by the Resident Engineer, and shall remove them from the site. The Contractor shall employ and keep engaged for this purpose an adequate number of laborers.
- D. SURPLUS MATERIALS - Each Contractor shall remove from the site all surplus materials when there is no further use for same.
- E. TOOLS AND MATERIALS - At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly removed.

### **1.24 Cleaning**

Each Contractor shall thoroughly clean all equipment and materials furnished and installed and shall deliver such materials and equipment undamaged in a clean and new appearing condition at time of substantial completion.

### **1.25 Inspections by Other City Agencies**

- A. LETTER OF COMPLETION - Just prior to substantial completion of this Project, the Commissioner will file with the Department of Buildings, an application for a Letter of Completion or a Certificate of Occupancy for the structure.
- B. FINAL INSPECTIONS - In connection with the above mentioned application for a Letter of Completion or a Certificate of Occupancy and before certificates of final payments are issued, each Contractor will be required to arrange for all final inspections by the inspectional staff of the Department of Buildings or other governmental agencies having jurisdiction, and secure all reports, sign offs, certificates, etc., by such inspection staff or other governmental agencies, in order that a Letter of Completion or Certificate of Occupancy can be issued promptly.

### **1.26 Security Guards/Fire Guards on the Site (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

#### **A. SECURITY GUARDS (WATCHMEN)**

- 1. The Contractor for General Construction Work shall provide competent Security Guards on the site until final completion of the project or earlier if so notified in writing by the Commissioner. The Security Service shall commence with the start of work. There shall be no less than one (1) Security Guard on duty every day, including Saturdays, Sunday and Holidays, 24 hours a day, except between the hours of 8:00 A.M. and 4:00 P.M. on any day which is a regular working day for a majority of the trades. This exception during the working day shall not apply after the finishing painting of the plaster work is commenced; thereafter, not less than one (1) Security Guard shall be on duty continuously, 24 hours a day, until final completion of the project or earlier if so notified in writing by the Commissioner.



2. Every Security Guard shall be required to hold a "Certificate of Fitness" issued by the Fire Department. Every Security Guard shall, during their tour of duty, perform the duties of Fire Guard in addition to their security obligations.
  3. Should the Commissioner find that any Security Guard is unsatisfactory, such guard shall be replaced by the Contractor for General Construction Work upon the written demand of the Commissioner.
  4. Each Security Guard furnished by the Contractor for General Construction Work shall be instructed by the Contractor for General Construction Work to include in their duties the entire construction site including the Field Office, temporary structures, and equipment, materials, etc.
  5. Should the Contractor for General Construction Work or any other Contractor consider the security requirements outlined above inadequate, it shall provide such additional security as it thinks necessary, after obtaining the written consent of the Commissioner. The additional cost of such approved increased protection will be paid by the Contractor who provides the additional protection.
  6. Nothing contained in this Article shall diminish in any way the responsibility of each Contractor for its own work, materials, tools, equipment, nor for any of the other risks and obligations outlined hereinbefore in this Article.
- B. **COSTS** - The Contractor for General Construction Work shall employ Security Guards/Fire Guards at all times, except as otherwise modified by the detailed Specifications and as approved by the Commissioner, for the purpose of safeguarding and protecting the site. All costs for Security Guards/Fire Guards shall be borne by the Contractor for General Construction Work.
- C. **RESPONSIBILITY** - All Contractors will be responsible for safeguarding and protecting their own work, materials, tools and equipment.

#### **1.27 Contractor's Daily Reports**

- A. **DAILY REPORTS** - As soon as the Contractor has started work on the Project, it shall submit to the Resident Engineer written daily reports of the work performed the previous day by any of its employees, including the employees of its subcontractors.
- B. **INFORMATION** - The reports shall be prepared by the Contractor's Superintendent and shall bear the Contractor's Superintendent signature. Each report shall contain the following information:
1. The type of materials and/or major equipment being installed by the Contractor and the total number of employees working in each category on that particular day.
  2. The names of the subcontractors working and the type of materials and/or major equipment being installed by each, together with the total number of employees working for each subcontractor on that particular day.
  3. The major construction equipment being used by each Contractor and/or subcontractor.

#### **1.28 Alternate or Substitute Equipment**

- A. In general, the Contract Drawings and Specifications show and describe arrangements suitable for the specific items of equipment either named or described. In the event that a Contractor submits for approval, and receives such approval, a device or piece of equipment which requires connections (vacuum, gas, steam, water, air, electric, etc.) or arrangements of these services, differing from those indicated or described in the Contract Documents, it shall be incumbent upon the Contractor submitting the alternate or substitute equipment to give timely notice to the other Contractors involved so that they may make suitable alterations in the work to accommodate the substitute or alternate equipment. The Contractor making the substitution shall be responsible for any and all additional

costs incurred by any of the Contractors by virtue of the substitution of equipment for the equipment named or described in the Contract Documents.

**1.29 Sleeve and Penetration Drawings (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. As soon as practicable after the commencement of work and when the order in which concrete for the first slabs, walls, etc. to be poured is determined, the Contractors for the engineering trades (Plumbing, Heating, Ventilating and Air Conditioning, and Electrical) shall submit to the Department of Design and Construction a sketch indicating the location and size of all penetrations for sleeves, ducts, etc. which will be required to accommodate the mechanical trades, in order that it may be determined if such penetrations will materially weaken the project's structure. The sketch will be stamped and returned if approved and/or comments will be transmitted. The engineering Contractors shall continue to submit sketches as the pouring schedule and the concrete work progresses and, until approvals for the penetration sketches have been given, shall not predicate their layout work on unapproved sketches.

**1.30 Location of Partitions (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. Within three (3) weeks after the concrete slabs have been poured on each floor level, the Contractor for General Construction Work shall immediately locate accurately all of the partitions, including the door openings, on the floor slabs in a manner approved by the Resident Engineer.

**1.31 Furniture and Equipment**

- A. RESPONSIBILITY - Each Contractor is responsible for moving all loose furniture and/or equipment in all areas when such furniture and/or equipment interferes with the proper performance of its work.
- B. PROTECTION - All such furniture and/or equipment must be adequately protected with dust cloths and returned to their original locations when directed to do so by the Resident Engineer.

**1.32 Overtime Work (Ordered by Commissioner)**

- A. OVERTIME - The Commissioner reserves right to order and pay for overtime work.
1. The Commissioner can order overtime work when in the Commissioner's opinion, delay occurs and such delay is not the fault of the Contractor, or
  2. When work is of such an important nature that delay in carrying such work to completion would result in serious disadvantage to the public.
- B. ORDER FOR OVERTIME WORK - When overtime work is ordered by the Commissioner, such "Order" will be issued by the Commissioner on a special form letter over the signature of the Commissioner.
- C. CONTRACTOR'S PROCEDURE PRIOR TO COMMENCING WORK
1. Make immediate application to the Commissioner of Department of Labor, State of New York, for dispensation in accordance with Subdivision 2 of Section 220 of the Labor Law.
  2. Upon receipt of such dispensation, proceed expeditiously with ordered overtime work.

**1.33 Compliance with OSHA Regulations**

These Contract Documents and the work hereby contemplated shall be governed, at all times, by the following Federal Laws:

- A. William Steiger Occupational Safety and Health Act of 1970, Public Law 91-596;

- B. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;
- C. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

### 1.34 Temporary Services

#### PART A (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. TEMPORARY WATER - during construction shall be furnished in the following manner:
  - 1. Immediately after the Contractor for General Construction Work has been ordered by the Commissioner to start work, it shall file an application with the Dept. of Environmental Protection for the schedule of charges for water use during construction. The Contractor for General Construction Work will be responsible for payment of water charges.
  - 2. Immediately after the Contractor for Plumbing Work has been ordered by the Commissioner to start work, it shall file an application with the Department of Environmental Protection's Bureau of Water Supply and obtain its permit to install the temporary water supply system. The system shall be installed and maintained for the use of all Contractors. A copy of the above mentioned permit shall be filed with the Commissioner. The Contractor for Plumbing Work shall provide temporary water main, risers and waste stacks as directed and install on each floor, outlets with two (2) 3/4" hose valve connections over a barrel installed on a steel pan. The Contractor for Plumbing Work shall provide drains from the pans to the stack and house sewer and hose bibs to drain the water supply risers and mains. During winter months the Contractor for Plumbing Work shall take the necessary precautions to prevent the temporary systems from freezing.
- B. TOILET FACILITIES - both exterior and interior, for the use of all Contractors, shall be furnished and installed in the following manner:
  - 1. Toilet fixtures shall be furnished, installed and maintained in a satisfactory operating condition by the Contractor for Plumbing Work.
  - 2. Enclosures for the toilet fixtures shall be erected and maintained by the Contractor for General Construction Work.
  - 3. Heating for the enclosures shall be furnished, installed and maintained by the Contractor for General Construction Work.
  - 4. Electric lighting for the enclosures shall be furnished, installed and maintained by the Contractor for Electrical Work.
  - 5. The Contractor for General Construction Work shall keep the temporary toilet fixtures and enclosures in a clean and sanitary manner.
  - 6. No Contractor shall cause any sanitary nuisances to be committed by its employees in or about the work. Each Contractor shall enforce all sanitary regulations of the City and State Health Authorities.
- C. OVERTIME USE - Whenever any Contractor(s) work before or after the regular work hours hereinafter specified under Subparagraph D, or on a Saturday, Sunday or Holiday of any trade, such Contractor(s) shall pay the Contractor for Plumbing Work for the activation of the temporary water system and toilet facility services during such overtime periods. When more than one (1) Contractor is involved in overtime work, the costs thereof shall be prorated as determined by the Resident Engineer. When overtime is required by any or all Contractors on the work, the provisions for payment for regular time use of the temporary water supply system as specified in Subparagraph D shall apply.

- D. **ACTIVATION** - The Contractor for Plumbing Work shall bear the cost of keeping the temporary water supply system activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning, to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week which is established as a regular working day for aforementioned trades and holds until completion and final acceptance of the work of the Contractor for Plumbing Work or until the services are terminated by instructions from the Commissioner.

**PART B (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. **WATER** - The Contractor for General Construction Work will be responsible for payment of water charges. Billing will be in accordance with the Department of Environmental Protection schedule of charges for Building Purposes.
- B. **ELECTRICITY** - for temporary light and the operation of small tools, is available in the area of this project and will be furnished to the Contractor for General Construction Work by the Contractor for Electrical Work without cost.
- C. **TOILET FACILITIES** - The Contractor for General Construction Work shall arrange with the Commissioner for the temporary use of certain toilets or washrooms within the project for the use of all employees during the execution of the work.
- D. **MAINTENANCE** - The Contractor for General Construction Work shall maintain the temporary toilet facilities in a clean and sanitary manner and make all necessary repairs due to misuse.
- E. **NUISANCES** - The Contractors shall not cause any sanitary nuisance to be committed by its employees in or about the work, and shall enforce all sanitary regulations of the City and State Health Authorities.

**1.35 Temporary Use, Operation and Maintenance of Elevators during Construction**

**PART A - FOR NEW BUILDINGS UP TO AND INCLUDING 15 STORIES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. **INSTALLATION** - The Contractor for General Construction Work shall install and complete, as indicated herein, one (1) selected main elevator in the Project for temporary operation by the Contractor for General Construction Work for the transporting of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction of work at the project. The Contractor for General Construction Work shall furnish, install and maintain for such elevators, all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices, and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.
- B. **RESPONSIBILITY** - The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of the temporary elevator or parts utilized in connection therewith, if required.

- C. **ACTIVATION TIME** - The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.
- D. **COMMENCEMENT OF SERVICE** - The Contractor for General Construction Work shall begin to provide temporary elevator service using the selected main passenger elevator no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed the following work shall have been completed:
1. The shaft shall have been completely enclosed by either the permanent or a temporary enclosure meeting the requirements of the law.
  2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
  3. There shall have been installed on all floors at the shaftway entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks and any necessary approved wire mesh barricades for adjacent shaftways.
  4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.
- E. **ELECTRICAL INSTALLATION** - The Contractor for Electrical Work, not later than 20 calendar days after the machine room roof slab or that portion of its surrounding the elevator has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the machine room to the low voltage transformers and car light outlets in the center of shaftway and for the car control and signal traveling cables. The Contractor for Electrical Work shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.
- F. **REMOVAL** - When elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor for General Construction Work shall remove the temporary enclosures and all temporary elevator equipment and promptly proceed with the installation of the permanent equipment as is required under the Contract.
- G. **INSPECTION** - Before temporary elevator equipment has been removed, a joint inspection of the equipment shall be made by the Contractor for General Construction Work and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection deems it necessary, the Contractor for General Construction Work shall furnish and install new governor and compensating ropes, new traveling cables and new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefor will be made in accordance with Article 26 of the Contract.
- H. **REPLACEMENT** - The Contractor for General Construction Work shall replace with new, any of the equipment or parts of the temporary elevator installation that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly

cleaned. Where lubricated rails are used they shall be washed down. If roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.

- I. COSTS - The Contractor for Electrical Work shall pay the costs of all electrical current used for operating the temporary elevators. The Contractor for General Construction Work shall provide all necessary conduit and wiring connections for the proper operation of the elevator and the signaling of the temporary elevators.
- J. LIMITATIONS OF USE - The temporary elevator shall not be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representatives of City Departments and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the various Contractors to hoist materials, which in the Resident Engineer's opinion will not overload or damage the elevator installation, but only after such times as all plastering has been completed from the second floor up. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged damage to the elevator installation within 24 hours after the elevator has been employed for the hoisting of materials by the particular Contractor(s).
- K. PAYMENT FOR USE - The Contractor for General Construction Work shall be paid for its operation and maintenance of the temporary elevator or permanent elevator used for temporary service at the daily rate indicated under the Item of its Contract. All other costs in connection with the elevator installation and equipment, excepting electrical work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
- L. LIQUIDATED DAMAGES - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide the temporary elevator service described in this section beginning with the 41<sup>st</sup> working day after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
- M. OVERTIME USE - All Contracts. Whenever any Contractor or Contractors work before or after the regular work hours as indicated in Paragraph B above, or on a Saturday, Sunday or Holiday, such Contractor or Contractors shall pay the Contractor for General Construction Work for the operation and maintenance of the temporary elevator, if required by such Contractor or Contractors, at the daily rate indicated in the Contract but increased to reflect the difference between regular wage rates and overtime wage rates. The basic hourly charge shall be considered as one ninth (1/9) of the amount shown in the Item of the Bid form of the General Construction Work Contract. The City will not pay any Contractor for such overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.

**PART B - FOR NEW BUILDINGS OVER 15 STORIES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. INSTALLATION - The Contractor for General Construction Work shall install and complete, as indicated herein, two (2) selected main elevators in the Project for temporary operation by the Contractor for General Construction Work for the transporting of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction over work at the project. The Contractor for General Construction Work shall furnish, install and maintain for such elevators, all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use. The two (2) elevators will not be operated simultaneously.

- B. **RESPONSIBILITY** - The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of the temporary elevator or parts utilized in connection therewith, if required.
- C. **ACTIVATION TIME** - The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.
- D. **LOW RISE ELEVATOR** - The Contractor for General Construction Work shall begin to provide temporary elevator service using one (1) selected main passenger elevator no later than six (6) weeks (30 working days) after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. No later than one (1) week, five (5) working days, after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped the following work shall have been completed:
1. The shaft shall have been completely enclosed up to the 12th Floor by either the permanent or a temporary enclosure meeting the requirements of the law.
  2. A temporary machine room enclosure shall have been provided at the 11th Floor and shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary, shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
  3. There shall have been installed on all floors up to and including the 9th Floor at the shaft entrances to the elevator, solid substantial wood frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaftways.
  4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.
- E. **ELECTRICAL INSTALLATION** - The Contractor for Electrical Work, not later than 10 calendar days after the 12th Floor slab or that portion of it surrounding the elevator, has been poured and stripped, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the temporary machine room, to the low voltage transformers and car light outlets in the center of the shaftway and for the car control and signal traveling cables. The Contractor for Electrical Work shall make all these required connections as soon as the Equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.
- F. **HIGH RISE ELEVATOR** - The Contractor for General Construction Work shall begin to provide temporary elevator service to all floors, using a selected main passenger elevator, no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed, the following work shall have been completed:

1. The shaft shall have been completely enclosed by either the permanent or temporary enclosure, meeting the requirements of the law.
2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
3. There shall have been installed on all floors at the shaftway entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaftways.
4. There shall have been furnished and installed, solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.

- G. The Contractor for Electrical Work, not later than 20 calendar days after the machine room slab or that portion of it surrounding the elevator shaft has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the high rise elevator to be used for temporary service and shall have connected such feeders to the terminals on the motor-generator starter panels or controllers in the machine room, to the signal circuits low voltage transformers for the annunciators and car light outlets in the center of shaftway.

The Contractor for Electrical Work shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.

- H. When the high rise elevator is completed and ready for temporary operation, the low rise temporary elevator shall be shut down.
- I. When one (1) or more elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor for General Construction Work shall remove the temporary enclosures and all temporary elevator equipment, and promptly proceed with the installation of the permanent equipment as is required under the Contract.
- J. Before temporary elevator equipment has been removed, a joint inspection of the equipment shall be made by the Contractor for General Construction Work and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection determines it necessary, the Contractor for General Construction Work shall furnish and install new governor and compensating ropes, new traveling cables, new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefor will be made in accordance with Article 26 of the Contract.
- K. The Contractor for General Construction Work shall replace with new, any of the equipment or parts of the temporary elevator installations that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheaves spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be removed from the rails. The full cost of parts replacement cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.
- L. The Contractor for Electrical Work shall pay the costs of all electrical current used for operating the temporary elevators. The Contractor for General Construction Work shall provide all necessary conduits and wiring connections for the proper operation of the elevators and the signaling of the temporary elevators.



- M. No temporary elevator shall be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representatives of City Departments and other governmental agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specific times to the various Contractors to hoist materials which, in the Resident Engineer's opinion, will not overload or damage the elevator installation, but only after such time as all plastering has been completed from the second floor up. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged damage to the elevator installation within 24 hours after the elevator has been employed for the hoisting of materials by the other Contractors.
- N. The Contractor for General Construction Work shall be paid for its operation and maintenance of each temporary elevator or permanent elevator used for temporary service at the daily rate indicated under the item of its Contract. All other costs in connection with elevator installation and equipment, excepting Electrical Work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
- O. LIQUIDATED DAMAGES - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide the temporary elevator service described in this Section beginning with the 31st working day after the 12th Floor slab, or that portion of the 12th Floor slab surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
- P. OVERTIME USE - ALL CONTRACTS. Whenever any Contractor(s) work before or after the regular work hours as indicated in Subparagraph B above, or on a Saturday, Sunday or Holiday, such Contractor or Contractors shall pay the Contractor for General Construction Work for the operation and maintenance of the temporary elevator, if required by such Contractor or Contractors, at the rate indicated in the Item of the bid form of the General Construction Work Contract but increased to reflect the difference between regular wage rates and overtime wage rates. The basic hourly charge shall be considered as one ninth (1/9) of the amount shown in the item of the General Construction Work Contract. The City will not pay any Contractor for such overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.

**PART C - EXISTING BUILDINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. The Contractor for General Construction Work may use, at the Commissioner's discretion, one (1) selected elevator in the project for temporary operation by the General Construction Work Contractor for the transportation of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction over work at the Project. The Contractor for General Construction Work shall maintain for such elevators, all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices hand reset target annunciators, signal devices, and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.
- B. The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of

the temporary elevator or parts utilized in connection therewith, if required.

- C. The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time of 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.
  - D. The Contractor for General Construction Work shall replace with new any of the equipment or parts of the elevator for temporary operation installation that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.
  - E. The elevator for temporary operations shall be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representative of City Departments and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the various Contractors to hoist materials which, in the Resident Engineer's opinion, will not overload or damage the elevator installation. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged employee for the hoisting of materials by the particular Contractor(s).
  - F. The Contractor for General Construction Work shall pay all costs for the operation and maintenance of the elevator for temporary operation. All other costs in connection with the elevator and equipment excepting electrical work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
  - G. LIQUIDATED DAMAGES - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide elevator services described in this section beginning with 15 consecutive calendar days from notice to proceed. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
  - H. OVERTIME USE - ALL CONTRACTS - Whenever any Contractor(s) work before or after the regular work hours as indicated in Paragraph B above, or on a Saturday, Sunday or Holiday, such Contractor(s) shall pay the Contractor for General Construction Work for the operation and maintenance of the elevator, if required by such Contractor(s) at the union daily rates but increased to reflect the difference between regular wage rates and overtime wage rates. The City will not pay any Contractor for overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.
- 1.36 General Mechanical Requirements (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**
- A. The General Mechanical Requirements contained herein shall be followed by all Contractors furnishing mechanical equipment under their respective Contracts.
  - B. CONCEALED PIPING - and ducts shall mean piping and ducts hidden from sight in masonry or other construction, in floor fill, trenches, partitions, hung ceilings, furred spaces, pipe shafts and in service tunnels not used for passage. Where piping and ducts run in areas that have hung ceilings, such piping and ducts shall be installed in the hung ceilings.
  - C. THE CONTRACT DRAWINGS - are in part diagrammatic and show the general arrangement of the equipment, ducts and piping included in the Contract and the approximate size and location of the

equipment. The Contractor shall follow these Contract Drawings in laying out the work and shall consult the Contract Drawings of the other Contracts to become familiar with all conditions affecting it and to verify the spaces in which it will be installed. The Contractor shall cooperate with the Public Utilities doing certain necessary work for this project. The attention of the Contractor is called to the Contract Drawings for General Construction Work for the location, arrangement and extent of plumbing and other fixtures and equipment. All work shall be installed in locations as shown on these Contract Drawings.

- D. CERTIFICATES - On completion of the work, the Contractor shall obtain certificates of inspection, approval, acceptance and of compliance with all laws from all agencies and/or entities having jurisdiction over the work and shall deliver these certificates to the Commissioner. The work shall not be deemed substantially complete until the certificates have been delivered.
- E. SHOP DRAWING SUBMITTALS - Contractors doing mechanical work shall submit, as directed, Shop Drawings, roughing drawings, manufacturer's Shop Drawings, field drawings, cuts, bulletins, etc., of all materials, equipment and methods of installation shown or specified.
  - 1. Submit sheet metal shop standards. Submit manufacturer's product data including gauges, materials, types of joints, scaling materials and installations for metal ductwork materials and products.
  - 2. Submit scaled layout drawing (3/8"=1') of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, slopes of horizontal runs, wall and floor penetrations and connections. Show modifications of indicated requirements made to conform to local shop practice and how those modifications ensure that free area, materials and rigidity are not reduced. Layouts should include all the room plans, mechanical equipment rooms and penthouses. Method of attachment of duct hangers to building construction all with the support details. Coordinate shop drawings with related trades prior to submission.
  - 3. Indicate duct fittings, particulars such as gauges, sizes, welds and configuration prior to start of work for low-pressure systems.
  - 4. Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data and shop drawings in maintenance manual.
- F. ACCESSIBILITY - All work shall be installed by the Contractor so as to be readily accessible for inspection, operation, maintenance and repair. Minor deviations from the arrangement indicated on the Contract Drawings may be made to accomplish this, but they shall not be made without approval by the Commissioner.
- G. CHANGES IN PIPING, DUCTS, AND EQUIPMENT - Wherever field conditions are such that for proper execution of the work, reasonable changes in location of piping, ducts and equipment are necessary and required, the Contractor shall make such changes as directed and approved, without extra cost to the City.
- H. CLEANING OF PIPING, DUCTS, AND EQUIPMENT - Piping, ducts and equipment shall be thoroughly cleaned by the Contractor of all dirt, cuttings and other foreign substances. Should any pipe, duct or other part of the several systems be obstructed by any foreign matter, the Contractor will be required to pay for disconnecting, cleaning and reconnecting wherever necessary for the purpose of locating and removing obstructions. The Contractor shall pay for repairs to other work damaged in the course of removing obstructions.
- I. STANDARDIZATION OF SIMILAR EQUIPMENT - Unless otherwise particularly specified, all equipment of the same kind, type or classification, and used for identical purposes, shall be the product of one (1) manufacturer.
- J. MACHINERY PARTS - shall conform exactly to the dimensions shown on the Contract Drawings. The equivalent parts of identical machines shall be identical so that they can be interchangeable.

- K. FITTINGS - All grease lubricating fittings on equipment shall be of a uniform type and shall be readily accessible and types proposed to be used shall be submitted for approval.
- L. GUARDS - All machinery shall be designed with protecting guards conforming with the requirements of the Industrial Code of the New York State Department of Labor or OSHA, whichever is stricter.
- M. LIMIT SWITCHES - Unless otherwise specified, limit switches and other mechanically actuated switches shall be enclosed in tight metal boxes and be installed in the proper locations ready for conduit connections. Switches shall be complete with all supports, stops, cams, arms, tripping and operating members, which shall be adjustable where required for proper functioning.
- N. ANCHORS, BOLTS, ETC. AND FOUNDATIONS - Unless otherwise specified, the Contractor shall furnish the necessary anchors, bolts, guides, track rails, bearing plates, substantial templates and all other appurtenances, and build the necessary foundations, as approved by the Commissioner, for all equipment supplied by the Contractor under its Contract.
- O. EQUIPMENT DESIGN - Equipment and appurtenances shall be designed in conformity with ASME and AIEE standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operations. Adequate stays, braces and anchors shall be provided. All bearings and moving parts shall be adequately protected against wear by bushings, or other approved means, and shall be fully lubricated by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers and the like shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.
- P. SUPPORTING STRUCTURES DESIGNED BY THE CONTRACTOR - Unless otherwise specified, supporting structures for equipment to be furnished by the Contractor shall be designed and built by the Contractor of sufficient strength to safely withstand all stresses to which they may be subjected, within permissible deflections, and shall meet the following standards:
1. Structural Steel - ASTM Standard Specifications, AISC and NYBC.
  2. Concrete for supports for equipment shall conform to the Specifications for concrete herein, but in no case shall be less than the requirements of the NYBC for average concrete.
  3. Steel reinforcement for concrete shall be of intermediate grade and shall meet the requirements of the Standard Specifications for Billet Steel-Concrete Reinforcement Bars, ASTM.
- Q. ENGINEER'S ASSUMED DESIGN DATA - All structural steel, concrete and reinforcement indicated or specified to support the equipment or appurtenances and the area immediately adjacent thereto have been designed from data based on assumed average anticipated clearances and loading. The final structural design in these locations will be based on definite data received from the Contractor after the Commissioner approves the equipment and appurtenances to be installed. The Commissioner will then redesign, if necessary, the supporting structure to properly support and maintain the approved equipment and appurtenances. Necessary major changes in design will be covered by Supplementary Drawings that will be furnished to the Contractor. All changes indicated or necessary to accommodate the equipment and appurtenances, shall be incorporated into the Working Drawings submitted for approval, and the cost of furnishing and installing the work necessitated by these changes shall be borne by the Contractor furnishing the equipment.
- R. INSTALLATION OF EQUIPMENT - Equipment shall be erected in a neat and workmanlike manner on the foundations, at the locations and elevations shown on the Contract Drawings or as required. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between various units and with piping and equipment that may be installed under other Contracts. When required by the Specifications, the Contractor shall obtain the assistance of a competent and experienced Engineer or Superintendent, in the employ of the manufacturer, to install the equipment.

- S. **ELIMINATION OF NOISE** - All work provided under the Contract shall operate without objectionable noise or vibration.
1. Should operation of any one or more of the several systems produce noise or vibration which is, in the opinion of the Commissioner, objectionable, the Contractor shall at its own expense make changes in piping, equipment, etc. and do all work necessary to eliminate objectionable noise or vibration.
  2. Should noise or vibration found objectionable by the Commissioner be transmitted by any pipe or portions of the structure from equipment installed under the Contract, the Contractor shall at its own expense install such insulators and make such changes in or additions to the installations as may be necessary to prevent transmission of this noise or vibration.
- T. **GROUTING** - The Contractor shall furnish all material and labor for proper bedding on Portland Cement grout, the equipment or its supporting base. Grout shall consist of one (1) part Portland Cement and one (1) part of approved sand. The top of the masonry foundation shall be properly cleaned and wetted before grouting. Grout shall completely fill all spaces between the equipment, or base, and the foundation and it shall generally average one (1) inch in thickness. Leveling wedges shall not be removed before the grout has reached its final set. Voids left by wedges shall be pointed with grout. Exposed surfaces of the grout shall have a finished appearance.
- U. **PRELIMINARY FIELD TEST** - As soon as conditions permit, the Contractor shall furnish all necessary labor and materials for, and shall make, preliminary field tests of the equipment to ascertain compliance with the requirements of the Contract. If the preliminary field tests disclose equipment that does not comply with the Contract, the Contractor shall, prior to the acceptance test, make all changes, adjustments and replacements required.
- V. **INSTRUCTIONS ON OPERATION** - At the time the equipment is placed in permanent operation by the City, the Contractor shall make all adjustments and tests required by the Commissioner to prove that such equipment is in proper and satisfactory operating condition. The Contractor shall instruct the City's operating personnel on the proper maintenance and operation of the equipment for the period of time called for in the Specifications.

### **1.37 General Electrical Requirements**

**SCOPE** - This Article sets forth the general requirements applicable to electrical work for the Project. Such requirements are intended to be read in conjunction with the Specifications and Contract Drawings for the Project. In the event of any conflict between the requirements set forth in this Article and the requirements of the Specifications and/or the Contract Drawings, whichever requirements is the most stringent, as determined by the Commissioner, shall take precedence.

### **PART A - PROCEDURE--ELECTRICAL APPROVALS**

**SCOPE**- This Section sets forth general electrical information, as well as required approvals for all electrical work required for the Project, including ancillary electrical work which may be included in contracts for other than the Contract for Electrical Work.

- A. **ELECTRIC SERVICE** - The electric service supply is subject to commercial and operating variation of the utility company. Proper provision shall be made to have all apparatus operate normally under these conditions.
- B. **SUPERVISION AND ACCEPTANCE** - The electrical work and equipment shall be installed under the supervision of the Commissioner's representative. Final acceptance and approval of the work will be contingent upon the inspection and test of the installation by the City regulatory agency, on completion.
- C. **TESTS** - The Contractor shall notify the Commissioner when the Contractor will examine and begin

work and shall also notify the Commissioner when the Contractor has completed the work and is ready to have it inspected and tested. Upon completion of the work and prior to final payment, tests shall be made as required by the Commissioner of all electrical materials, electrical and associated mechanical equipment, and of appliances installed hereunder. The Contractor shall furnish all labor and material for such tests. Should the tests show that any of the material, appliances or workmanship are not first class or not in compliance with the Contract, the Contractor on written notice shall remove and promptly replace them with other materials in conformity with the Contract.

D. CERTIFICATE OF THE BUREAU OF ELECTRICAL CONTROL, OF THE DEPARTMENT OF BUILDINGS (B.E.C.) - Before final payment is made, there must be filed with the Department of Design and Construction, a Certificate of Inspection signed by the Director of the B.E.C., which Certificate shall certify that all materials and workmanship comply with the rules and regulations of the B.E.C. of the City of New York and with the Electrical Code of the Administrative Code of the City of New York.

E. RESPONSIBILITY FOR CARE AND PROTECTION OF EQUIPMENT

1. The Contractor furnishing any equipment shall be responsible for the equipment until it has been finally inspected, tested and accepted, in accordance with the requirements of these Specifications.
2. After delivery and before and after installation, the Contractor shall protect all equipment against theft, injury or damage from all causes. The Contractor shall carefully store all equipment received for work, which is not immediately installed. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through a special dielectric test as directed by the Commissioner, at the expense of the Contractor or replaced by the Contractor without additional cost to the City.

F. UNIFORMITY OF EQUIPMENT - Any two (2) or more pieces of apparatus or materials of the same kind, type or classification and being used for identical types of service, shall be made by the same manufacturer.

G. CONTRACTOR'S ELECTRICAL DRAWINGS AND SAMPLES FOR APPROVAL

1. The Contractor shall submit to the Commissioner for approval, complete dimensional drawings of all equipment, wiring diagrams, motor test data, details of control, installation layouts showing all details and locations and including all schedules, and descriptions and supplementary data to comprise complete working drawings and instructions for the performance of the work. A description of the operation of the equipment and controls shall be included. A letter, in triplicate, shall accompany each submittal.
2. The Contractor shall submit duplicate samples of such materials and appliances as may be requested by the Commissioner for approval. These samples shall be properly tagged for identification and submitted for examination and test. After the samples are approved, one (1) sample will be returned to the Contractor and the other sample will be filed in the office of the Commissioner's representative for inspection use. After the Contract is completed, the second set of samples will be returned to the Contractor.

H. TIMELINESS - All material shall be submitted in sufficient time for the program of construction. Failure to promptly submit acceptable samples and dimensional drawings of equipment will not be accepted as grounds for an extension of time. The Commissioner may decline to consider submittals unless all related items are submitted at the same time.

I. CONTRACTOR'S STATEMENT WITH SUBMITTALS - All dimensional drawings of equipment, blueprints, catalogues, models, samples and other data relative to the equipment, the materials, the work or any part thereof submitted for approval are to be accompanied by a statement that they have been examined by the Contractor and that the drawings, data and other material submitted agree with the requirements of the Contract and Specifications and shall list and describe the points of

disagreements, if any exist. In the absence of such statement, approvals will be given with the understanding that articles of equipment or materials or methods of installation are in substantial compliance with the Contract and that if the adoption of these designs, details, articles, equipment, materials, constructions, installations, places and locations necessitate changes, alterations or replacements at an increased cost to the Contractor or others, the Contractor making the substitution for the specified equipment or material shall bear all such additional expense involved.

- J. BULLETINS AND INSTRUCTIONS - The Contractor shall furnish and deliver to the Commissioner, after acceptance of the work, four (4) complete sets of instructions, technical bulletins and any other printed matter (diagrams, prints, or drawings) required to provide complete information for the proper operation, maintenance and repair of the equipment and the ordering of spare parts.

#### PART B - TEMPORARY LIGHTING, SITE SECURITY LIGHTING & POWER

SCOPE - This Section sets forth the General Conditions and procedures relating to Temporary Lighting, Site Security Lighting and Power during the construction period, and is applicable to, and binding on, all Contracts insofar as they are affected.

A. **TEMPORARY LIGHTING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. Energy for the Temporary Lighting System for minor rehabilitation projects (those projects whose existing distribution system is not being changed or modified under the scope of this project) may be taken from the existing electrical distribution system if the existing system is of adequate capacity for the additional temporary lighting load. The Contractor for Electrical Work is to cooperate and coordinate with the facility custodian so as not to interfere with the normal operation of the facility.
2. Energy for the Temporary Lighting system for new projects and for those existing projects that are not covered in the preceding paragraph shall be provided as in the following paragraphs.
3. CONNECTION TO UTILITY LINES - Temporary Electric Service for use during construction shall be provided as follows: The Contractor for Electrical Work shall provide adequate service for the temporary lighting system, or a minimum of 100 Amperes, 3-phase, 4-wire service for the temporary lighting system, whichever is greater, and make all necessary arrangements with the Public Utility Company and pay all charges by them for the Temporary Lighting system. The Contractor for Electrical Work shall include in its bid any charges which may be made by the Public Utility Company for extending its electrical facilities, and for making final connections. The Contractor for Electrical Work shall make payment directly to the Public Utility Company.
4. APPLICATIONS FOR METER - The Contractor for Electrical Work shall make application to the Public Utility Company and sign all documents necessary for, and pay all charges incidental to, the installation of a watt hour meter or meters for Temporary Lighting. The Contractor for Electrical Work shall pay to the Public Utility Company, all bills for Temporary Lighting energy used throughout the work, as they become due.
5. SERVICE AND METERING EQUIPMENT - The Contractor for Electrical Work shall furnish and install, at a suitable location on the site, approved service and metering equipment for the Temporary Lighting System, ready for the installation of the Public Utility Company's metering devices. The temporary service mains to and from the metering location shall be not less than 100 Amperes, 3-phase, 4-wire and shall be of sufficient capacity to take care of all demands for Temporary Lighting and Site Security Lighting and shall meet all requirements of the NYCEC.
6. The Contractor for Electrical Work shall furnish and connect to the metered service point, a system of Temporary Lighting to illuminate the entire area where work is being performed and points adjacent to the work, with separately fused circuits for stairways and bridges. Control switches for stairway circuits shall be located near entrance on ground floor.

7. ITEMS - The Temporary Lighting System shall consist of wiring, fixtures, left-hand double sockets, (one (1) double socket for every 400 square feet, with one (1) lamp and one (1) three-prong outlet) lamps, fuses, locked type guards, trailers and any other incidental material. Additional details may be outlined in the detailed Specifications for the Electrical Work. Changes may be made, provided the full equivalent of those requirements is maintained.
8. The Temporary Lighting System shall be progressively installed as required for the advancement of the work under the various Contracts.
9. RELOCATION - Any Contractor requiring the relocation or extension of the original Temporary Lighting System that is not required due to the normal advancement of the work, as determined by the Commissioner's field representative, shall bear all costs thereof.
10. TRAILERS - Trailers shall be furnished with left-hand sockets with locked type guards and 40 feet of rubber covered cable. The Contractor for Electrical Work shall furnish and distribute a minimum of three (3) complete trailers to each Contractor. See the detailed Electrical Specifications for possible additional trailers required.
11. LAMPS - The Contractor for Electrical Work shall furnish and install one (1) complete set of lamps, including those for the trailers. Broken and burned out lamps in the general lighting system shall be replaced by the Contractor for Electrical Work while those in the trailers shall be replaced by the Contractor using such equipment. All lamps shall be 100 watt.
12. CIRCUIT PROTECTION - The Contractor for Electrical Work shall furnish and install GFI protection for the Temporary Lighting and Site Security Systems.
13. ENERGIZING - The Contractor for Electrical Work shall keep the Temporary Lighting System energized from a period of time, 15 minutes before the established starting time of that trade, which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week which is established as a regular working day for any trade involved in the construction of this facility and holds until completion and final acceptance of the work of the Contractor for Electrical Work or until the services are terminated by instructions from the Commissioner.
14. MAINTENANCE OF TEMPORARY LIGHTS
  - a. The Contractor for Electrical Work shall maintain the Temporary Lighting System in good working order during the scheduled hours established.
  - b. The Contractor for Electrical Work is to include in its contract all charges for energy for the Temporary Lighting System.
  - c. The Contractor is advised to show the estimated cost of the installation, maintenance and energy of temporary electrical facilities in its detailed cost estimate of its Contract so as to facilitate partial payments during construction.
15. OVERTIME USE - Any Contractor requiring Temporary Lighting Service before or after hours set forth hereinbefore, or on weekends or a Holiday for all trades involved in the construction of this facility, shall pay for the additional cost of keeping the system energized and repaired. If more than one (1) Contractor is involved, the charges shall be prorated, or shared by other acceptable means previously agreed upon by the Contractors involved. When overtime is required by all Contractors on the work, the provisions for payment for regular time use of the Temporary Lighting System shall apply.
16. SERVICE BEYOND COMPLETION DATE - When failure to comply with the terms and conditions of any Contract necessitates temporary light beyond the date set for completion of the Contract for Electrical Work, the Contractor requiring such additional service shall pay for keeping it energized. When more than one (1) Contractor requires such service, the expense thereof shall be prorated



as determined by the Commissioner.

17. **ADJUSTMENT IN CONTRACT PRICE FOR TEMPORARY LIGHTING MAINTENANCE** - In the event that the temporary lighting maintenance extends beyond the Contract time through no fault of the Contractor for Electrical Work, the additional maintenance cost will be in accordance with the requirements of the following paragraphs:

- a. Payment for maintaining Temporary facilities when required will be made at the average hourly wage for electricians plus 69% of this rate, for each hour of work done upon order of the Resident Engineer. Payments will be included in partial estimates upon submission of detailed vouchers stating date, hour and time expended for each item of work.
- b. The addition of 69% of the average hourly wage rate specified above shall be deemed as the total allowance for all profit and overhead and for any and all other costs and expenses of any nature whatsoever, including but not limited to allowance for insurance, workman's compensation, unemployment insurance and other supplementary benefits.

18. **REMOVAL OF TEMPORARY LIGHTING WIRING** - The temporary lighting system shall be removed by the Contractor for Electrical Work when authorized by the Commissioner.

19. **HAND TOOLS** - The temporary electric lighting system shall not be used for power purposes, excepting that light hand tools not larger than 1/4 horsepower may be operated therefrom by any Contractor.

**B. SITE SECURITY LIGHTING (FOR NEW CONSTRUCTION ONLY) (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. The Contractor for the Electric Work shall furnish, install and maintain a system of site security lighting, as herein specified, to illuminate the construction site of the project, and it shall be connected to and energized from the Temporary Lighting System.
2. It is essential that the site security lighting system be completely installed and operating, at the earliest possible date. All Contractors must cooperate, coordinate and exert every effort to accomplish an early complete installation of the site security lighting system. After the system is installed and in operation, and a part of the system interferes with the work of any trade, that trade shall be completely responsible for the expense of removing, relocating and replacing all equipment necessary to reinstate the system to proper operating conditions.
3. The system shall consist of flood lighting by pole mounted guarded sealed-beam units. Floodlight units shall be mounted 16 feet above grade. Floodlights shall be spaced around the perimeter of the site to produce an illumination level of no less than one (1) foot candle around the perimeter of the site, as well as in any potentially hazardous area or any other area within the site that might be deemed by the Resident Engineer to require security illumination. The system shall be installed in a manner acceptable to the Resident Engineer. The first lighting unit in each circuit shall be provided with a photoelectric cell for automatic control. The photoelectric cell shall be installed as per manufacturer's recommendations.
4. All necessary poles shall be furnished and installed by the Contractor for Electrical Work.
5. The site security system shall be kept illuminated at all times during the hours of darkness. The Contractor for Electrical Work, at its own expense, shall keep the system in operation, furnishing and installing all material necessary to replace all damaged or burned out parts.
6. The Contractor for Electrical Work shall be on telephone call alert for maintaining the system during the operating period stated above.
7. All materials and equipment furnished under this section shall remain the property of the Contractor for Electrical Work and shall be removed and disposed of by the Contractor for

Electrical Work upon completion of that phase of the project.

C. TEMPORARY POWER

1. Any Contractor requiring temporary power for equipment larger than 1/4 horsepower shall arrange with the Public Utility for service and pay for all electrical energy consumed by its lines.
2. The Contractor shall provide service, metering equipment and distribution centers as required, and be responsible for keeping the system in working order.
3. When directed by the Commissioner, the Contractor shall remove its own temporary power system.

D. USE OF COMPLETED PORTIONS OF THE ELECTRICAL WORK

1. USE OF MAIN DISTRIBUTION PANEL - As soon as the permanent electric service feeders and equipment, metering equipment and main distribution panel are installed and ready for operation, the Contractor for Electrical Work shall have the temporary lighting system changed over from the temporary service points to the main distribution panel.
2. COST OF CHANGE OVER - The Contractor for Electrical Work shall be responsible for all cost due to this change over of service and it shall also make application to the Public Utility Company for a watt hour meter to be set on the permanent meter equipment.
3. The requirements for temporary lighting specified herein shall be adhered to after change over of service.
4. NO EXTRA COST - The operation of the service and switchboard equipment shall be under the supervision of the Contractor for Electrical Work, but this shall in no way be interpreted to mean the acceptance of such part of the installation or relieve the Contractor from its responsibility for the complete work or any part thereof. There shall be no additional charge for supervision by the Contractor for Electrical Work.

PART C - ELECTRICAL INSTALLATION PROCEDURE

SCOPE - This Section sets forth the general installation procedure that shall apply to all electrical work and electrical equipment appearing in any of the Contracts.

- A. INTENT OF CONTRACT DOCUMENTS - Contract Specifications and Contract Drawings are to be interpreted as a means of conveying the scope and intent of the work without giving every minor electrical detail. It is intended, nevertheless, that each Contractor shall provide whatever labor and materials are found necessary, within the scope of its Contract, for the successful operation of the installation. Specific details of individual installations are to be finally decided upon when the Contractor submits Working or Shop Drawings for approval to the Department of Design and Construction. Whenever there are two (2) or more methods to complete project work within the Contract scope, the Commissioner reserves the right to choose that method which, in the Commissioner's opinion, will afford the most satisfactory performance, lasting qualities, and accessibility for repairs, even though this selection is the most costly.
- B. SCHEMATIC PLANS - APPROXIMATE LOCATIONS - Conduits and wiring are shown on the plans for diagrammatic purposes only. Therefore, conduit layouts may not necessarily give the actual physical route of the conduits. The Contractor who installs a conduit system will also be required, as part of the work, to furnish and install all hangers and pull-boxes, including any special pull-boxes found necessary to overcome interferences, and to facilitate the pulling of electrical cables. Similarly, the locations of equipment, appliances, outlets and other items shown on Contract Drawings are only approximate and are to be definitively established when equipment Shop Drawings are submitted and approved by the Department of Design and Construction during construction.

- C. SLEEVES - required for conduits passing through walls or floors, shall be furnished and set by the Contractor installing the conduits. Sleeves in waterproofed floors shall be provided with flashing extending 12 inches in all directions from sleeve and secured to waterproofing. Flashing shall be turned down into space between pipe and sleeve and caulked watertight. Flashing shall be 20 oz. cold rolled copper. Sleeves shall be supplied with welded flanges similar to those supplied by the Contractor for Plumbing Work and shall extend one (1) inch above finished floor.
- D. COORDINATION - Each Contractor shall keep in close touch with the construction progress and obtain the necessary information for the accurate placement of its work in ample time before project construction operations obstruct its work. Each Contractor is to consult all other Contract Drawings, as well as approved equipment Shop Drawings on file in the Resident Engineer's Field Office. This will aid in avoiding interferences, omissions and errors in the electrical installation.
- E. RESPONSIBILITY FOR ERRORS OF INSTALLATION - In case of interference with the work of others or erroneous placement of work with respect to equipment or structures, each Contractor shall cooperate with other affected Contractors for an immediate agreeable solution of the affected work with each Contractor furnishing its responsible share of the labor and materials necessary to complete the installation in an approved manner.
- F. RESTORATION - If drilling or cutting is done on finished surfaces of equipment or the structure, any marring of the surface shall be repaired or replaced by the Contractor who caused the damage. Each Contractor shall be held responsible for corrective restoration due to its cutting or drilling, and for any damage to the project or its contents caused by the Contractor or the Contractor's workers. Any Contractor who pierces waterproofing because of the installation of their work shall, at their own expense, restore the waterproofing to the satisfaction of the Commissioner.
- G. ELECTRICAL WORK AT SITE - Any Contractor who is required to furnish equipment consisting of a number of related electrical devices or appliances, mounted in a single enclosure, or on a common base, shall furnish this unit complete with internal wiring, connections, terminal boxes with copper connectors and/or lugs and ample electrical leads, ready for connection and operation. The cost of any wiring, re-wiring or other work required to be done on this unit in the field, shall be borne by the Contractor who furnished the unit, without cost to the City.
- H. COOPERATION AMONG CONTRACTORS - Whenever an electrically operated unit or system involves the combined work of several Contractors for its installation and successful operation, each Contractor shall exercise the utmost diligence in cooperating with others to produce a complete, harmonious installation.
- I. DEFINITIONS
1. WIRING means both wire and raceway (rigid steel, heavy wall conduit unless specifically indicated otherwise).
  2. POWER WIRING means wiring from a panelboard or other specified source to a starter (if required) then to a disconnect (if required) then to the final point of usage such as a motor, unit or device.
  3. CONTROL and/or INTERLOCK WIRING means that wiring that signals the device to operate or shut down in response to a signal from a remote control device such as a temperature, smoke, pressure, float, etc. device (starters and disconnect switches are not included in this definition) regardless of the voltage required for the controlling device.
- J. WORK BY CONTRACTORS FURNISHING ELECTRICAL EQUIPMENT - Any Contractor who furnishes an electrically operated or motorized unit of equipment shall install same and, as part of its Contract, perform the following work in connection therewith:
1. FOUNDATIONS - Unless otherwise specified or indicated, the Contractor furnishing electrically operated equipment shall also furnish and install approved foundations for same. Special

foundations, if required, will be described in the detailed Specification.

- a. MATERIAL - All foundations, unless required otherwise, shall rest on a structural slab and shall be of poured concrete, of a mixture specified for reinforced concrete. Foundations shall present a neat, smooth appearance without voids, sharp corners or edges.
  - b. DIMENSIONS - Foundation dimensions, height above floor, methods of setting, aligning and anchoring of equipment shall be as recommended by the manufacturer of equipment and approved by the Commissioner. The minimum height of foundations above finished floor shall be four (4) inches and foundations shall extend at least six (6) inches at all sides beyond the base plates of equipment.
2. At least one (1) inch of grout shall be applied under the equipment base plate after placement and alignment of the equipment.
  3. ITEMS - Anchor plates, bolts, sleeves, nuts and washers and other necessary items for proper installation of equipment shall be provided. The Contractor shall also furnish and set required templates to locate accurately the positions of the hold down bolts.
  4. VIBRATION ISOLATION - If specifically required in the detailed Specifications for a particular unit, vibration isolators shall be provided for rotating equipment.
  5. SUPPORTS - If any motorized equipment is required to be mounted overhead or off a wall, the Contractor supplying the unit shall furnish and install a suitable platform, bracket or shelf, whichever is appropriate or specified, and mount the equipment thereon. This support shall be constructed of substantial steel members, plates, etc., and the whole securely fastened to the structure or to anchors previously embedded in the wall or slab. In case of excessive vibration transmitted to structure, isolating pads or other devices shall be installed. The Contractor shall apply one (1) coat of approved primer paint to the support and one (1) additional coat of approved paint in the field.
  6. ASSOCIATED EQUIPMENT - The Contractor who furnishes a motorized or electrically operated unit of equipment shall also furnish all associated motor starters, disconnect means, relays, control devices, lamps, or other devices, necessary for the successful functioning of the unit.
  7. POINT OF DELIVERY - Any item specified to be installed by the Contractor for Electrical Work and delivered to the site that can not be hand carried (due to bulk, weight or timeliness) to the location of its installation is to be delivered and set in place, leveled and secured by the Contractor furnishing the equipment. Such delivery shall be to the location where it is to be installed by the Contractor for Electrical Work.
  8. CONTROL AND INTERLOCK WIRING
    - a. General Construction Work and Plumbing Work.
      - (1) All control wiring associated with doors and door hardware is to be furnished and installed, unless otherwise indicated, by the Contractor furnishing the doors. Power for the door operation and for its controls shall be furnished and installed by the Contractor for Electrical Work.
      - (2) All other control wiring associated with equipment furnished by either the Contractor for General Construction Work or the Contractor for Plumbing Work is to be furnished and installed by the Contractor for Electrical Work.
    - b. Contractor for Heating, Ventilating and Air Conditioning Work
      - (1) The furnishing and installing of all control devices and all control and interlock wiring for equipment furnished under the Heating, Ventilating and Air Conditioning Contract shall be

by that Contractor, including any power required for any control device.

- (2) The Contractor for Heating, Ventilating and Air Conditioning Work shall deliver to the Contractor for Electrical Work all starters and disconnect switches specified to be furnished under the Heating, Ventilating and Air Conditioning Contract. The Contractor for Electrical Work is to install the starters and disconnect switches, and furnish and install all power wiring and make connections between the starter, disconnect switch and motor or equipment being served. The motor or equipment is to be mounted by the Contractor furnishing the motor.

9. INSTALLATION OF BURNER - The Contractor who furnishes and installs the gas/oil-fired boiler/furnace shall also include as part of its Contract, the work of furnishing, installing and connecting all equipment, controls with necessary conduits and wiring, to a service point provided by the Contractor for Electrical Work. Unless detailed otherwise in the Specific Requirements, the Contractor for Electrical Work shall furnish power from the power source to a junction box furnished and installed by the Contractor for the Electrical Work and located near the boiler/furnace control panel. The Contractor for Electrical Work shall also furnish and install an empty conduit and a junction box to be located at a remote location (outside of the boiler/furnace room) for an emergency shut-off switch. The shut-off switch and all other conduit and wire shall be furnished and installed by the Contractor furnishing the boiler/furnace.

K. WORK BY CONTRACTOR FOR ELECTRICAL WORK - The Contractor for Electrical Work shall perform the following work:

1. PANELETTE - The Contractor for Electrical Work shall furnish and install a four (4) circuit panelette in each mechanical equipment room.
2. STARTERS AND DISCONNECT SWITCHES - The associated disconnect switches and starters approved by the Department of Design and Construction which require mounting or wiring apart from a main equipment unit shall be delivered, prewired, to the Contractor for Electrical Work at the site of the project, who shall install and wire them. The electrical Contractor shall acknowledge acceptance in writing to the Contractor supplying them, and thereafter assume responsibility for their safe keeping until final acceptance of its work by the City.
3. CONTROL DEVICES - The Contractor for Electrical Work shall install conduit, wire, and make all connections for all interlock and control devices furnished under the Plumbing Work Contract and also all control and interlock devices furnished under the General Construction Work Contract, except for door control wiring. The various control and interlock devices, furnished (prewired) by the Contractors for Plumbing and General Construction Work Contractors, shall be installed and final connections made by the Contractor for Electrical Work.
4. DOOR CONTROL WIRING - Unless specifically detailed otherwise in the Contract Documents for Electrical Work, all door control and interlock devices are to be furnished and installed and wired by the Contractor furnishing the required control and interlock devices.
5. TESTS - The Contractor supplying the equipment, together with the Contractor for Electrical Work shall cooperate in making preliminary tests to establish the correctness of the installation. If a faulty operation of the unit is discovered, the Contractor whose work is the cause shall, without delay, remedy the trouble.

L. PAINTING

1. Ingredients and methods of application shall conform to that as required for similar work under the Contract for General Construction Work.
2. ALL METAL CABINETS - including switchboards, panelboards, boxes (pull, junction and outlet), trims, doors and covers shall be painted as follows:

All surfaces inside and outside, one (1) approved coat of primer. All accessible surfaces one (1) coat of approved paint inside and outside, in the field after installation.

3. **HANGERS, CONDUITS AND FITTINGS** - The Contractor who installs them shall give one (1) field applied, approved coat primer, followed by a second coat.
4. **FINAL COAT**--A final or third coat of paint, as directed, shall be applied by the Contractor installing them when the wall surfaces on which they are supported or the ceiling from which they are hung are not painted by the Contractor for General Construction Work. Pull boxes shall be neatly and legibly stenciled to show service.
5. **PAINTING OF MOTORIZED EQUIPMENT** - The Contractor furnishing electrically driven equipment shall paint motors and driven equipment, starters and controllers and other equipment provided by the Contractor. The Contractor shall provide any painting or finishing that may be required in the Specifications. For certain equipment having special corrosion resistant factory finishes, painting may be waived by special permission. Equipment shall be neatly stenciled, with legible characters to indicate service by the Contractor who supplies the equipment.
6. **NAME PLATES** - shall be left clean of all paint.

**PART D - ELECTRICAL CONDUIT SYSTEM INCLUDING BOXES (PULL, JUNCTION AND OUTLET) - (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

**SCOPE** - This Section sets forth the requirements applying to any Contract requiring the installation of electrical conduits, boxes or fittings. Rigid steel conduit shall be used through out, unless specifically indicated otherwise. **TYPES**-where the word 'conduit', without a modifier such as, rigid steel, EMT, etc., is specified to be used, it shall be interpreted to mean, rigid steel, heavy wall, threaded conduit.

**A. CONDUIT TYPES**

1. **RIGID STEEL CONDUIT** - shall be interpreted to mean rigid steel, heavy wall conduit that is hot dipped galvanized inside and outside. The conduit shall meet the requirements of the latest edition, as amended, of the "Standard for Rigid Steel Conduit" of the Underwriters' Laboratories, Inc. Unless otherwise specified in the Specifications or indicated on the Contract Drawings, rigid steel conduit shall be used for all exposed work, for all underground conduits in contact with earth and for fire alarms systems as required by the Building Code. Rigid steel conduit shall be used for all underground conduits in contact with earth, for Fire Alarm Systems and as required by authorities having jurisdiction.
2. **ELECTRICAL METALLIC TUBING (EMT)** - shall be industry standard thin wall conduit of galvanized steel only. All elbows, bends, couplings and similar fittings which constitute a part of the conduit system shall be specifically designed for use with electric metallic tubing. Couplings and terminating fittings shall be of the pressure type as approved by the Commissioner. Set screw fittings will not be acceptable. EMT shall meet the requirements of the latest edition, as amended, of the "Standard for Electrical Metallic Tubing of the Underwriters Laboratories Inc." EMT may only be used where specifically indicated. In no case will EMT be permitted in spaces other than hung ceilings and dry wall partitions.
3. **FLEXIBLE METALLIC** - For final connections to motors and motorized equipment, not more than a 4' - 0" length of flexible conduit may be used; for watertight installations, this conduit shall be of a watertight type, attached with watertight glands or fittings, for final connections from outlet box to recessed lighting fixtures and in locations only where specifically permitted by the Specifications or Contract Drawings.

**B. INSTALLATIONS AND APPLICATIONS**

1. Unless otherwise specified or indicated on the Contract Drawings, conduit runs shall be installed

concealed in finished spaces.

2. **CONDUIT SIZES** - The sizes of conduit shall be as indicated on the Contract Drawings. Wherever conduit sizes are not indicated, the conduit shall meet the requirements of the NYCEC to accommodate the conductors to be installed therein.
3. Conduits shall be reamed smooth after cutting. No running threads will be permitted. Universal type couplings shall be used where required. Conduit joints shall be screwed up to butt. Empty conduits after installation shall have all open ends temporarily plugged to prevent the entrance of water or other foreign matter.
4. Conduits being installed in concrete or masonry shall be securely held in place by the Contractor installing them during pouring and construction operations. A group of conduits terminating together shall be held in place by a template.
5. **UNDERGROUND STEEL CONDUITS** - Unless otherwise specified, all underground steel conduits in contact with earth shall be encased by the Contractor who installs them, in a covering of not less than two (2) inches of an approved concrete mixture. Concrete mix shall be one (1) part cement to four and one-half (4 ½) parts of fine and coarse aggregate.
6. **EXCAVATION RESTORATION PERMITS** - The Contractor installing underground conduits, duct banks or manholes shall perform, as part of its Contract, the work of cutting pavement, excavation shoring, keeping trenches or holes pumped dry, backfilling, restoration of surfaces to original condition and removal of excess earth and rubbish from premises. During the work, the Contractor shall provide adequate crossovers, protective barriers, lamps, flags, etc., to safeguard traffic and the public. When the work is in a public highway or street, the Contractor shall secure and pay for all necessary permits and inspection fees and pay the cost of repaving.
7. **EXPOSED CONDUIT SUPPORTS** - Exposed conduit shall be supported by zinc coated hangers with necessary inserts, beam clamps of approved design or attached to walls or ceilings by expansion bolts. Exposed conduits shall be supported or fastened at intervals not more than five (5) feet.
8. Exposed conduit shall be installed parallel or at right angles to ceiling, walls and partitions. Where direction changes of exposed conduit cannot be made with neat bends, such as required around beams or columns, conduit type fitting shall be used.
9. The conduit shall be installed with an approved expansion joint:
  - a. Wherever the conduit crosses a building expansion joint (each Contractor will be held responsible for determining where the building expansion joints are located).
  - b. Every 200 feet, when in straight runs of 200 feet or longer.
10. Conduit may only enter and leave a floating slab in the vertical direction, and then only in an approved manner. Horizontal entries into floating slabs are not permitted.
11. Conduit installed in pipe shafts shall be properly supported to carry the total weight of the raceway system complete with cable. In addition at least one (1) horizontal brace per 10 ft. section shall be provided to assure stability of the raceway system.
12. **BUSHINGS AND LOCKNUTS** - Approved bushings and locknuts shall be used wherever conduits enter outlet boxes, switch boxes, pull boxes, panel board cabinets, etc. For conduits one (1) inch in diameter or larger, insulating bushings to be O.Z. or approved equal.
13. **CONDUIT BENDS** - shall be made without kinking conduit or appreciably reducing the internal diameter. All bends in conduit of two (2) inch in diameter or larger shall be made with an hydraulic or power pipe bender. The radius of the inner edge of any bend shall not be less than six (6)

times the internal diameter of the conduit where rubber covered conductors are to be installed. And not less than 10 times the internal diameter of the conduit where lead covered conductors are to be used. Long gradual sweeps will be required, rather than sharp bends, when changes of direction are necessary.

#### 14. EMPTY CONDUITS

- a. TESTS - All conduits and ducts required to be installed and left empty shall be tested for clear bore and correct installation by the Contractor who installed them using a ball mandrel and a brush and snake before the installation will be accepted. The ball shall be of lignum vitae turned to approximately 85% of the internal diameter of the raceway to be tested. Two (2) short wire brushes shall be included in the mandrel assembly. Snaking of conduits, ducts, etc., shall be performed by the Contractor in the presence of the Electrical Inspector. Any conduits or ducts which reject the mandrel shall be cleared at once with the Contractor bearing all costs, such as chopping concrete, to replace the defective conduit and restore the surface to its original condition.
- b. TAGS - Numbers or letters shall be assigned to the various conduit runs, and as they test clear they shall be identified by a fiber tag not less than 1-¼ inch width, attached by means of a nylon cord. All conduit terminations in panel, splice or pull boxes as well as those out of the floor or ceiling shall be tagged.
- c. TEST RECORDS - As the conduit runs clear, a record shall be kept under the heading of "Empty Conduit Tested, Left Clear, Tagged and Capped" showing conduit designation, diameter, location, date tested and by whom. When complete, this record shall be signed by the Electrical Inspector and submitted in triplicate for approval. This record shall be entered on the Record drawings, which are required under "General Conditions Governing All Contracts."
- d. CAPPING - All empty conduit and duct openings, after test, shall be capped or plugged by the Contractor as directed.
- e. DRAG LINES - A drag line shall be left in all empty conduit.

#### C. BOXES

1. The Contractor shall furnish and erect all pull boxes indicated on the plans or where required. Sides, top and bottom of pull boxes shall be zinc coated and shall be built of No. 12 USSG steel reinforced at corners by substantial angle irons and riveted or welded to plates. Bottom or side of pull boxes shall be removable and held in place by corrosion resistant machine screws. Pull boxes in damp locations shall have threaded hubs and gaskets. All pull boxes shall be suspended from ceiling or walls in the most substantial manner.
2. For large boxes, sufficient suitable porcelain clamp insulators or other approved devices shall be provided in the pull boxes for supporting the cables passing through the box so that the cables will not be unsupported for a distance greater than three (3) feet and so as to permit a neat and orderly arrangement of the cables.
3. For pull boxes having the largest side more than nine (9) square feet in area, special rectangular and diagonal angle-iron bracing will be required as approved.
4. Pull boxes of special or odd shapes are required to be installed by the Contractor, even though not shown on plans, where necessary to overcome interference or to facilitate the pulling of conductors in conduits.
5. In centering outlets, the Contractor is cautioned to allow for overhead pipes, ducts and other obstructions, and for variations in arrangement and thickness of fireproofing, soundproofing and plastering. Precautions should be exercised regarding the location of window and door trims,



paneling, etc. Mistakes resulting from failure to observe these precautions, must be corrected by the Contractor without cost to the City. Outlets in hung ceilings shall be supported from the black iron or structure.

6. The exact location of all outlets in finished rooms shall be as directed. When the interior finish has been applied, the Contractor shall make any necessary adjustment of its work to properly center the outlets. All outlet boxes for local switches near doors shall be located at the strike side of doors as finally hung, whether so indicated on the drawings or not.
7. Exposed wall outlet boxes shall be erected neatly and tight against the walls and securely anchored to same.
8. All wall outlets of each type shall be set accurately at the same level on each floor, except where otherwise specified or directed. Where special conditions occur, outlets shall be located as directed.
9. MOUNTING HEIGHTS - The following heights are standard heights and are subject to correction due to coordination with Contract Drawings. All such changes must be approved by the Resident Engineer. Heights given are from finished floor to center line of outlet or device on wall or partition, unless otherwise indicated.

a. General Convenience Outlets	
(mount vertical)	1'-6"
b. Clock Outlets	8'-6" or 1'-6" below ceiling
c. Wall Lighting Switches	4'-0"
d. Motor Controllers	5'-0"
e. Motor Push-button	4'-2"
f. Telephone Outlets	As Directed
g. Fire Alarm Bells	8'-6" or 1'-6" below ceiling
h. Fire Alarm Stations	4'-0"
i. Intercom Outlet	1'-6"
j. Cooking and Refrigerator Unit	As Directed
10. Outlet boxes shall be of approved design and construction; of form and dimensions suited and adapted to its specific location; the kind of fixture to be used and the number and arrangements of conduits, etc., connecting therewith. All ferrous outlet boxes shall meet the requirements for zinc coating as specified under Electrical Conduit Systems.
11. There shall be knockouts opened only for the insertion of conduit. Any outlet boxes with more openings than are necessary for conduit insertion, shall be sealed by the Contractor without additional charge.
12. All outlet boxes and junction boxes for exposed work shall be galvanized cast iron or cast aluminum with threaded openings. Outlet boxes for exposed inside work in damp locations shall be galvanized cast iron or cast aluminum with threaded hubs and neoprene gaskets.
13. Junction boxes shall not be less than 4 11/16" square and shall be equipped with zinc coated plates. Where plates are exposed they shall be finished to match the room decor.
14. FIXTURE SUPPORTS - Outlet boxes supporting lighting fixtures shall be equipped with fixture studs held by approved galvanized stove bolts or integral with the box. Cast iron or malleable boxes shall have four (4) tapped holes for mounting required cover or fixtures.
15. Outlet boxes exposed to the weather or indicated W.P., shall be cast iron or cast aluminum and the covers made watertight with neoprene gaskets. The boxes shall have external lugs for mounting. Drilling of the body of the fitting for mounting will not be permitted. The cover screws shall be appropriate in size, noncorrodible and not less than four (4) in number for each box opening.

**PART E - ELECTRICAL WIRING DEVICES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. WALL SWITCHES shall be of the best specification grade, quiet type, and shall have a rating of 20 Amperes at 277 volts, as manufactured by Bryant, Hubbell or approved equal. The mechanism shall be equipped with arc snuffers. They shall be of the tumbler type, single pole. Switches of the 3-way type shall have a similar rating.
- B. RECEPTACLES
  - 1. CONVENIENCE OUTLETS - shall be of the best specification grade, duplex, two-pole, 3-wire, 15 Amperes at 125 volts. It shall have a grounding pole that shall be grounded to the conduit system. Receptacles shall be capable of both back and side wiring and shall have only one (1) grounding screw. Receptacles shall be Hubbell Cat. #5262 or approved equal.
  - 2. HEAVY DUTY RECEPTACLE OUTLETS - shall have the Ampere rating and the number of poles specified on the Contract Drawings and shall be Hubbell, Russell-Stoll, Bryant, AH & H or approved equal. Each outlet shall have a grounding pole, which shall be grounded to the conduit system.
  - 3. FLOOR RECEPTACLES - shall be Russell & Stoll #3040 or approved equal, to fit into floor box previously specified.
  - 4. NAMEPLATES - are required for all receptacles other than 120V.
- C. CLOCK HANGERS - Clock outlets for surface type clocks shall be equipped with a supporting hook and recessed faceplate to conceal the electrical cord.
- D. WATERTIGHT DEVICES - For installations exposed to weather or in damp locations, the devices shall be in a gasketed, cast iron enclosure.
- E. PLATES
  - 1. Every convenience outlet and switch outlet shall be covered by means of a stainless steel No. 302 - 0.4" antimagnetic plate with an approved finish, unless provided otherwise in the detailed Specifications.
  - 2. Where two (2) or three (3) switches are grouped together a single faceplate shall be used. Where more than three (3) switches are located at one (1) point, the faceplates may be made up in multiple units.

**PART F - ELECTRICAL CONDUCTORS AND TERMINATIONS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. CONDUCTORS FOR LIGHT AND POWER - All wire and cable shall be of annealed copper of 98% conductivity. Aluminum wire or cable will not be permitted. The insulation shall be flame retardant, moisture and heat resistant, thermoplastic, type THW or THWN rated for 600 volts at 75 degrees C. for both wet and dry locations. Wires No. 8 or larger shall be stranded. Wires and cables shall also be subject to the requirements of the NYCEC. Cables for incoming service or wire in conduits contiguous with the earth or in concrete or other damp or wet locations shall be synthetic rubber insulated with neoprene jacket, heat and moisture resistant and shall be equal to UL Type USE and rated for 600 volts at 75 degrees C. for both wet and dry locations.
- B. FIXTURE WIRE - Lighting fixtures shall be wired with No. 14 gauge wire designated as AWM and rated at 105 degrees C.
- C. OTHER TYPES - Cables and wires for interior communication systems are described in detailed

Specifications of applicable Contracts.

- D. MINIMUM SIZE - Conductors smaller than No. 12 AWG shall not be used for light or power.
- E. COLOR CODE - Wires shall have a phase color code, and multiple conductor cables shall be color coded.
- F. CABLE DATA - The Contractor shall submit for approval the following information for each size and type of cable to be furnished.
  - 1. Manufacture of Cable - Location of Plant.
  - 2. Minimum insulation resistance at standard test temperature.
  - 3. Days required for delivery to site of work after order to proceed with manufacture.
- G. ORIGINAL REELS - Cable and wire shall be delivered to the site of the work on original sealed factory reels.
- H. TESTS
  - 1. NOTIFICATION OF TEST - No cable shall be released for shipment from the mill unless authorized by the Commissioner. The Contractor shall give the Commissioner at least 10 days notice when the cable will be available for testing at the mill. The Contractor's representative or inspector shall have access during working hours to all parts of the plant where the cable is being manufactured, and all reasonable inspection and testing facilities shall be afforded to the Contractor without increase in price to the City. The Inspector shall witness the complete test of cable and receive a copy of all test data.
  - 2. TEST DATA - The Contractor shall forward to the Commissioner six (6) copies of all test data for approval before accepting shipment of the cable.
  - 3. INSPECTION DURING MANUFACTURE - The Commissioner reserves the right to dispatch a representative to the factory at any time during the period of manufacture of the cable for the purpose of expediting or checking progress. The living and traveling expenses of the City Engineers making these inspections and witness tests will be borne by the City of New York.
  - 4. TEST IN CITY LABORATORY - Sufficient additional length of conductor shall be provided on each reel, so that a six (6) foot sample may be removed for testing in the City's Laboratories. This sample shall be cut from the reel in the presence of the Inspector of the Department of Design and Construction and cut in two (2) three-foot lengths, each piece to be tagged showing reel number, size and type, manufacture, date, name or project & Contract number. Samples shall be handed to the Inspector for transmittal. If it is found as the result of test that the cable does not comply with the approved factory test the Contractor will be ordered to remove all cable which came off the reel and has been installed, and to replace the defective cable not used, without cost to the City. The Contractor will be held responsible for any delays in the construction program caused by the defective cable.
  - 5. FINAL FIELD TEST - After conductors are installed and connected, the City will test the work for overall insulation resistance. The Contractor shall furnish all test equipment necessary. To be acceptable, the test shall meet the requirements set forth in the NYCEC.
- I. WIRE INSTALLATION
  - 1. INSTALL WIRES AFTER PLASTERING - Feeder and branch circuits wiring shall not be installed in conduit before the rough plastering work is completed. No conductors shall be pulled into floor conduits before floor is poured.

2. CONDUIT SECURED IN PLACE - No conductor shall be pulled into any conduit run before all joints are made up tightly and the entire run rigidly secured in place.
3. WIRE ENDS - All wires shall be left with sufficiently long ends for proper connection and stowing.
4. PULLING COMPOUNDS - When required to ease the pulling-in of wires into conduit, only approved compounds as recommended by cable manufacturers shall be used.
5. PRESSURE CONNECTORS - for wires shall be of the cast copper or forged copper pressure plate type. Connectors shall be O.Z., Burndy, National Electric Products or approved equal.
6. Splices and feeder taps in the gutters of panel boxes shall be made by means of pressure plate type connectors encased in composition covers as manufactured by O.Z., Burndy, National Electric Products or approved equal.
7. Splices in branch wiring for sound systems and fire systems, shall be first made mechanically secure, then soldered and taped.
8. In lieu of soldered splices (except for sound and Fire Systems, which must have soldered splices) the following alternates are acceptable for operating temperatures up to 105 degrees C., for fluorescent fixtures and for the splicing of branch circuit wiring up to No. 8 AWG wire:
  - a. Mechanical splices made with mechanical connectors as manufactured by the Minnesota Manufacturing Company "Scotchlock" or approved equal. Mechanical connectors requiring a special tool (pressure connectors, insulators and locking rings) by Buchanan or approved equal. The tool used for connector application shall be as approved by the connector manufacturer.
  - b. For wire and cable No. 6 AWG and larger for branch circuit wiring the seamless tubular connector will only be accepted. Application of this connector shall be with a tool recommended by the connector manufacturer.
9. TAGS - All feeders and risers shall be tagged at both ends, and in all pull and junction boxes and gutter spaces through which they pass. Such tags shall be of fiber and have the feeder designation and size stamped thereon.
10. BRANCH CIRCUIT WIRING
  - a. The Contractor installing branch circuit wiring shall test the work for correct connections and leave all loop splices in the fixture outlet boxes properly spliced and taped. The Contractor shall provide wire ends long enough for convenient connection to device.
  - b. NEUTRALS - No common neutrals shall be used except for lighting branch circuits. Each neutral wire shall be terminated separately on a neutral busbar in the panelboard. No common neutrals will be permitted for convenience receptacle branch circuits.

#### J. TERMINATIONS

1. LUGS - All lugs for all devices and all cable terminations shall be copper. AL/CU rated lugs will not be permitted. The only exception to this requirement is when the particular device is not manufactured with copper lugs by any manufacture. Lugs for No. 6 AWG cable and larger shall be cast copper or forged copper pressure plate type. Lugs for 1/0 and larger shall be fastened with two (2) bolts.
2. All lugs shall be of the proper size to accept the cable connected to them. Any Contractor furnishing a device containing lugs is to coordinate with the Electrical Work Contract Documents to insure that the device terminations are adequate for the wire or cable (whose size may be larger than expected due to voltage drop considerations) connected to the device. This requirement

applies to both the Contractor for Electrical Work whose branch circuit protector must have lugs of the proper size, as well as to the Contractor who furnishes the device who may have to increase the size of that particular device.

**PART G - CIRCUIT PROTECTIVE DEVICES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

SCOPE - This Section sets forth the circuit protective devices such as circuit breakers and safety switches, used in connection with Motor Control Equipment, Distribution Centers, Panelboards and Service Entrance.

**A. CIRCUIT BREAKERS**

1. CIRCUIT BREAKERS shall be operable in any position and shall be of the quick-make, quick-break type on manual operation. The handle shall be trip free, preventing contacts from being held in closed position against abnormal overloads or short circuits. Positive visual indication of automatic tripped position of breaker shall be provided, in addition to the "On" and "Off" indication. All circuit breakers shall be of the bolted type.
2. TRIP RATING - Circuit breakers shall be provided with the required number of trip elements, calibrated at 40 degrees C., ambient temperature, in accordance with wire sizes or motor currents as shown on Contract Drawings or indicated in the Specifications.
3. POLE BARRIERS - Multipole pole breakers shall be designed to break all poles simultaneously. They shall be provided with barriers between poles and arc suppressing devices.
4. ELEMENTS - Multipole circuit breakers shall have frames of not less than a 100 Ampere rating. Multipole circuit breakers for 480 volts AC operation shall have an NEMA interrupting rating of 18,000 Amperes, unless a higher rating is specified in the Specific Requirements or indicated on the Contract Drawings.
5. For circuit breakers with frame size up to and including 225 Amperes, the breakers may be provided with non-interchangeable trip elements. For frame ratings above 225 Amperes, the breakers shall be provided with interchangeable trip elements, which can be replaced readily.
6. The trip rating of all circuit breakers shall not exceed 70% of frame rating.
7. Single pole circuit breakers for branch circuits shall have a frame size of no less than 100 Amperes, and shall be rated at 125 volt A.C. with a NEMA interrupting rating of 10,000 Amperes, unless a higher rating is specified in the Specific Requirements or indicated on the Contract Drawings.
8. INVERSE TIME ACTION - The circuit breakers shall be dual element type, one (1) element with time limit characteristics, so that tripping will be prevented on momentary overloads, but will occur before dangerous values are reached, the other with instantaneous trip action. Inverse time delay action shall be effective between a minimum tripping point of 125% of rating of breaker and an instantaneous tripping point between 600% and 700% of rated current.
9. CONSTANCY OF CALIBRATION - The tripping elements shall insure constant calibration and be capable of withstanding excessive short circuit conditions without injury.
10. CONTACTS shall be non-welding under operating conditions and of the silver to silver type.
11. TEMPERATURE RISE - Current carrying parts, except thermal elements shall not rise in temperature in excess of 30 degrees C. while carrying rated current at rated frequency.
12. NUMBERING - Each circuit breaker shall be distinctly numbered when installed in a group with other breakers. The calibration of trip element shall be indicated on each breaker.

**B. SAFETY SWITCHES**

NEMA TYPE HD - When safety switches are permitted to be used for service entrance, motor disconnecting means or to control other types of electrical equipment, they shall be of the type HD of a rating not less than 30 Amperes. Enclosures shall be provided with means for locking. For ratings above 60 Amperes terminals shall have double studs.

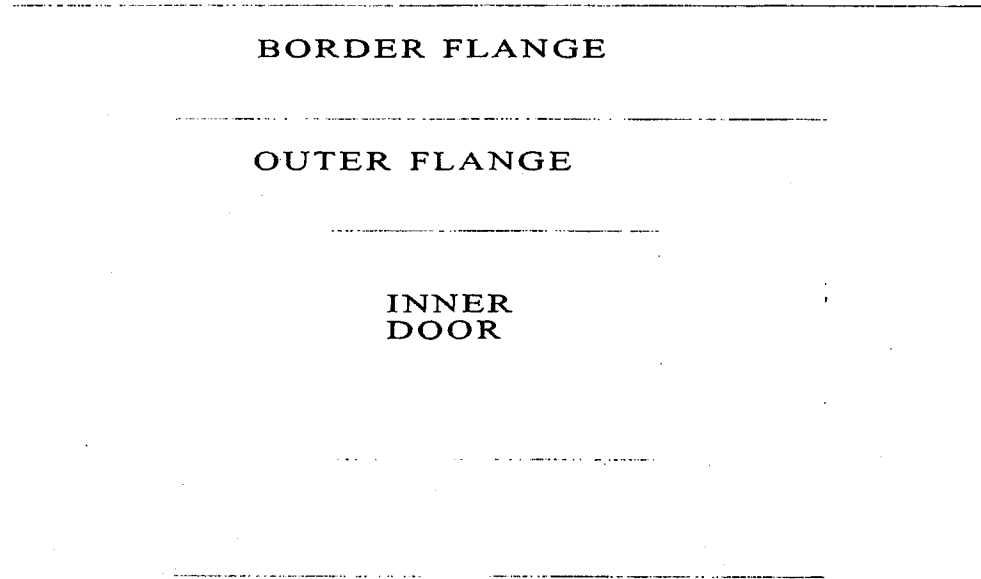
**PART H - DISTRIBUTION CENTERS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

SCOPE - This Section sets forth the construction and installation procedure for Switchboards, Panelboards and Cabinets.

- A. **PANELBOARDS--GENERAL TYPE** - The panelboards shall be of the automatic circuit breaker type with individual breakers for each circuit, removable without disturbing the other units. Circuit breakers shall be in accordance with the requirements outlined under "Circuit Protective Devices."
- B. **NUMBER AND RATING OF CIRCUIT BREAKERS** - The Contract Drawings show a layout of each panel, giving the number, frame, size and trip setting of circuit breakers and number of branch circuits and spare breakers. Each branch circuit shall be distinctly numbered.
- C. **BUS-BAR CONSTRUCTION AND SUPPORT** - Panel Boards shall be of the deadfront type and shall have bus bars and branch circuits designed to suit the system and voltage. Current carrying parts, exclusive of circuit breakers shall be copper and based on a maximum density of 1,000 Amperes per square inch. Bus bars for the main switchboard shall be designed for the frame rating of the Service Breaker. Bus bars shall run up the center of the panel, unless otherwise indicated, and shall have connected thereto the various branch circuits. Unless otherwise specified, bus bars for each panelboard shall be equipped with main lugs only and capacity as required on Contract Drawings. Where main protection is required, automatic circuit breakers shall be used. A neutral bus of at least the same capacity as a live bus bar shall be provided for the connection of all neutral conductors. Each terminal shall be identified. All current carrying parts, exclusive of circuit breakers, shall be of copper with a minimum number of joints. The bus bar structure shall be a self supporting unit, firmly fastened to a ½ inch plastic board, extending the full length and width of assembly which shall serve to insulate the bus structure from the back of panel box. Other methods affording equally effective bus structure support and insulation will be given consideration. An insulating barrier shall separate neutral bus from other parts of panel.
- D. **CIRCUIT BREAKER ASSEMBLY** - The entire circuit breaker and bus bar assembly shall be mounted on an adjustable metal base or pan and secured to the back of panel box. The panel shall have edges flanged for rigidity.
- E. **PANEL MOUNTING** - The panel shall be centered in the panel box to line up with door openings and set level and plumb so that no live parts are exposed with the door open.
- F. **PANEL CABINET CONSTRUCTION AND SUPPORT**
  - 1. Panel boxes shall be fabricated from No. 12 USSG sheet steel of no more than three-piece construction, reinforced at the corners and with continuous welds. Boxes having a back whose area is larger than 16 square feet, shall be of No. 10 USSG sheet steel and reinforced to provide ample stiffness and to prevent buckling. Boxes shall be of sufficient size to afford a clear gutter space on all sides, of not less than six (6) inches.
  - 2. **PANEL CABINET INSTALLATION** - When installed surface, or in panel closets, they shall be mounted on Kindorf channel, supported from floor slab to ceiling slab.
  - 3. Where cabinets cannot be set entirely flush due to shallow walls or partitions or where cabinet is extra deep, the protruding sides of cabinet shall be trimmed with a metal or hardwood return

molding of approved design and fastened to cabinet so as to conceal the intersection between the wall and cabinet.

- G. CABINET TRIM - Trim for both lighting and power panelboards shall be door-in-door type installation as depicted in DETAIL A TRIM FOR LIGHTING AND POWER PANELBOARDS. Construction details are to be as described in the following paragraphs.



#### DETAIL A TRIM FOR LIGHTING AND POWER PANELBOARD

1. CABINET TRIM - The trim and doors for lighting and power panels shall be made of No. 12 USSG full finish sheet steel in one (1) piece. Cabinet trim larger than 16 square feet shall be made of No. 10 USSG. The inner door shall cover the circuit breaker section only and be provided with appropriate brass hinges. The outer door shall cover the entire gutter space and shall be attached to the border type flange with appropriate hinges. Both doors for power panels shall be provided with a New York City Lock No. 511S, with key change to No. 47 and two (2) keys. For lighting panels, the inner door shall be provided with a substantial catch. All hinges shall be of the concealed type. Locks shall be flush with trim. In addition, for panels requiring doors over 48 inches in height, furnish a vault handle and a 3-point catch arranged to fasten door at top, bottom and center.
  2. The door shall close against a flange or rabbet to afford a dust tight fit. All space between the panel and the cabinet trim shall be closed by means of a sectional plate secured to the trim.
  3. The border flange of the trim shall be fastened to the box with oval head screws finished to prevent corrosion or with approved trim clamps.
  4. To facilitate installation of trim, a suitable angle iron shall be spot welded across the bottom of each trim to carry the weight of the trim while the holding screws are being put in place.
- H. MOTOR CONTROL CENTERS - Motor centers shall be furnished by the Contractor as indicated in the Specifications or Contract Drawings, but shall be installed by the Contractor for Electrical Work.
- I. NAMEPLATES - Nameplates where required, shall be made of engraved Lamicoid sheet, or approved

equal. Letters and numbers shall be engraved white on a black background (except for Firehouse projects which shall have white letters on a red background) the Contractor shall submit an engraved sample for approval as to design and style of lettering before proceeding with the manufacture of the nameplate. Nameplates shall be of suitable size and shall also be provided at the top of the switchboard or section thereof and on the trim at the top of all lighting and power panels. Similar nameplates shall also be provided for each distribution circuit breaker giving the breaker number, the number of the feeder, and the name of the equipment fed.

- J. SHOP DRAWINGS - showing all details of boxes, panels, etc., shall be submitted for approval.
- K. DIRECTORIES - A directory shall be fastened with brass screws and consist of a noncorrosive metal frame with dimensions not less than five (5) inches x eight (8) inches and a transparent window of Plasticile, Plexiglass, Lucite or approved equal that is not less than 1/16 inch thick over cardboard or heavy paper. The directory shall be typewritten and show the number of each circuit, the name of circuit and lighting or equipment supplied. The size of riser feeder shall be as indicated on directory. The dimensions of directory shall be submitted for approval for each size of panel.
- L. CONSTRUCTION
  - 1. FINISH - Panel boxes, doors and trim for installation in dry locations, shall be zinc coated after fabrication by the hot-dip galvanizing or electroplate process on inside and outside surfaces. In damp locations, panelboards shall be enclosed and gasketed NEMA 3R type. Panelboards located outdoors or exposed to the weather shall be cast iron.
  - 2. PAINTING - Panel boxes, doors and trim shall receive a coat of approved priming paint and a second coat of approved paint in the field after installation. Paint shall be applied to the inside and outside of boxes and on both sides of trim. Panel trims and doors shall receive a third or finishing coat on the outside after installation. Approval as to texture and color must be obtained before the final coat is applied. All of the aforementioned painting is to be done by the Contractor who furnishes the boxes and trim. Where panel trims or boxes are installed on walls which are to be painted, the previously mentioned third or finishing coat of paint shall be included in the work of the Contractor who has the Contract for general interior painting.

#### **PART I - MOTORS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

SCOPE - This Section sets forth the general design, construction and performance requirements, which shall apply to all motors furnished in any of the Contracts.

- A. MOTOR DESIGN - All motors shall be designed to comply with the New York State Energy Code currently in effect. Motors shall have standard NEMA frames and shall have nameplate ratings adequate to meet the specified conditions of operation. Motor performance under variable conditions of voltage and frequency shall be within the limits set in NEMA standards, unless modified in present Specifications. Motors shall be expressly designed for the hazard duty load, voltage and frequency as specified in the Contract. All motor windings shall be copper. All motors intended to operate on a 208 volt system shall be designed and rated for 200 volts.
- B. MOTORS OF SAME MANUFACTURER - Unless expressly permitted otherwise by the Commissioner, all motors under the same Contract shall be manufactured by the same company. Exceptions may be granted in the case of motors of 1/4 horsepower rating and smaller, or for a motor that is an integral part of the equipment, with its housing especially built for this purpose.
- C. STANDARDS OF COMPARISON - In general, the best standard products of the leading motor manufacturers shall be considered as a standard for comparison. The requirements of the NEMA standards for motors and generators shall be deemed to contain the minimum requirements of performance and design.
- D. OBJECTIONABLE NOISES - Objectionable noises will not be tolerated and exceptionally quiet motors



may be required for certain specified locations. Noise control tests as per the Building Code of the City of New York may be performed as directed by the Commissioner. Such motors shall bear a nameplate lettered "Quiet Motor." Springs and slip rings shall be of approved non-ferrous material.

E. BEARINGS

1. Bearings, unless specified otherwise, shall be of the ball or roller type. Motors one (1) horsepower and larger that are equipped with ball roller bearings shall also have lubrication of the pressure-relief greasing type. Each Contractor who furnishes four (4) or more such motors shall also furnish, as part of its Contract, a pressure grease gun of rugged design, of approximately 10 ounce capacity, complete with necessary adapters. The Contractor shall also provide 10 pounds of approved gun grease.
2. For any particular unit where sleeve bearings are deemed desirable, permission for their use may be granted by the Commissioner. Motors one (1) horsepower and larger that are equipped with sleeve type bearings shall in addition to having protected accessible fittings for oiling be provided with visible means for determining normal oil level. Lubrication shall be positive, automatic and continuous.

F. MOTOR TERMINALS AND BOXES - Each motor shall be furnished with flexible leads of sufficient length to extend for a distance of not less than three (3) inches beyond the face of the conduit terminal box. This box shall be furnished of ample size to make and house motor connections. These requirements shall be met irrespective of any other standards or practices. Size of cable terminals and conduit terminal box holes shall be subject to approval. For motors five (5) horsepower or larger, each terminal shall come with two (2) cast or forged copper pressure type connectors with bolts, nuts and washers. For motors of smaller ratings, connectors of other acceptable types may be furnished. For installations exposed to the weather or moist locations, terminal boxes shall be of cast iron with threaded hubs and gasketed covers. Cover screws shall be of non-corrosive material.

G. MOTOR TEMPERATURE RISES - The motor nameplate temperature rises for the various types of motor enclosures shall be as listed below:

- |   |               |
|---|---------------|
| 1. Open Frame                               | 40 degrees C. |
| 2. Totally enclosed and enclosed fan cooled | 55 degrees C. |
| 3. Explosion proof and submersible          | 55 degrees C. |
| 4. Partially enclosed and drip proof        | 40 degrees C. |

The temperature of the various parts of a motor shall meet the requirements of NEMA standards for the size and type of the motors. Tests for heating shall be made by loading the motor to its rated horsepower and keeping it so loaded for the rated time interval or until the temperature becomes constant.

H. SPECIAL CODE INSTALLATIONS - Electrical installations covered by special publications of NBFU and by special City rulings and regulations shall comply in design and safety features with such applicable codes, regulations and rulings, and shall be furnished and installed complete with all accessories and safety devices as therein specified.

I. MOTORS ON LIGHTING PANELS - The largest A.C. motor permitted on branch circuits of lighting panels shall not exceed 1/4 horsepower.

J. MOTORS RATED 1/2 horsepower and larger shall be polyphase.

K. TESTS

1. FACTORY INSPECTION - Electrical equipment and devices (except portable) not covered by standard Specifications or tests herein prescribed shall be inspected and witnessed on test at the factory with the tested equipment being completely assembled and connected under conditions approved by the Commissioner as equivalent to the actual working conditions. Suitability and

ruggedness of the design for the specified purpose will be a condition for acceptance.

2. **SHOP TESTS** - to determine the load performance of motors shall be made in accordance with Standard C-50, of the ASA. Motors shall meet the requirements of C-50 for insulation resistance, dielectric strength, efficiency and temperature rise. Efficiency (and power factor for A.C. motors) shall be established for 50, 75 and 100 percent of rated horsepower but for motors of 100 horsepower or larger, the 125 percent loading shall be included.
  3. **TEST REPORTS** - The result of shop tests shall be submitted to the Commissioner for approval and shall be on forms approved by the City. The evaluated test data shall include a signed statement confirming the fact that the equipment meets the requirements of the standards of performance.
  4. **MANNER OF TEST** - For motors of 100 horsepower or smaller, check tests against complete tests of similar motors will be accepted. For motors larger than 100 horsepower, complete tests for each motor furnished shall be made, and certified test data sheets shall be submitted for approval, unless shop tests are required by the Detailed Specifications.
  5. **PREFERRED METHODS** - The efficiency of fractional horsepower motors shall be determined by the input-output method; for larger motors up to and including 100 horsepower, the separate loss method as specified in ASA Standards C-50 will be accepted unless otherwise required in the Specifications.
- L. **SPARE PARTS** - The Contractor who furnishes motors, including fractional horsepower, shall provide the following spare parts and accessories in connection therewith:
1. **BRUSHES** - One (1) additional set of brushes for each motor equipped with them.
  2. **BEARINGS** - For each group of three (3) and fraction thereof, of each type and size of motor, the Contractor shall furnish one (1) set of extra bearing linings or ball or roller bearings. Where less than three (3) of any type of motor is involved, one (1) set of extra bearings shall be furnished.
  3. **SPRINGS** - One (1) set of brush springs used in slip ring motor or universal type motors.
  4. **WRAPPER MARKING** - All parts shall be delivered neatly and securely wrapped and boxed, plainly tagged and marked for identification and reordering.

**PART J - MOTOR CONTROL EQUIPMENT (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

**SCOPE** - This Section sets forth the requirements for motor controllers and associated devices, which are applicable to all Contracts under which motor control equipment is furnished or installed.

- A. **MANUFACTURER** - All control equipment furnished under one (1) Contract shall be the product of a single manufacturer. Exceptions to this rule may be granted in the case of controllers for fractional horsepower motors driving special equipment, the various units of which have been engineered to obtain specific performance.
- B. **CONTROL ITEMS REQUIRED** - The Contractor who furnishes a motor shall also furnish therewith complete disconnecting, starting and control equipment as required by the detailed Specifications, the various code authorities and for the successful operation of the driven equipment. These items include circuit breaker, magnetic starter with overload protection and low voltage release or protection, push button stations, pilot lights and alarms, float, pressure, temperature and limit switches, load transfer switches, devices for manual operation and speed controllers, etc. The Contractor shall furnish as many of these items as are required for the successful operation of the driven unit.
1. Where a motor is to be located out of sight of the controller, the Contractor who furnishes the motor shall furnish an approved disconnecting means to be mounted near motor.

## C. TYPES OF STARTERS

1. SQUIRREL CAGE - A.C. motors of the squirrel cage type, rated from one (1) to 30 horsepower shall have magnetic across the line starters; motors rated above 30 horsepower shall be furnished with reduced voltage (autotransformer type) starter or part winding start with time delay to reduce inrush current. Size of starters shall be based on 200V. operation.
2. SLIP RING - A.C. Motors of the slip-ring type shall be furnished with primary across the line starters interlocked with secondary starting and regulating equipment. The interlocking feature shall prevent starting of the motor when the secondary controller is off the initial starting point.
3. MAGNETIC - For fractional horsepower motors, magnetic type starters are not required unless the particular method of controlling the driven equipment makes them necessary. Where individual single phase fractional horsepower motors or the sum of fractional horsepower motors controlled by an automatic device are  $\frac{1}{2}$  horsepower or more, magnetic starters and circuit breakers shall be used. Single phase A.C. motors smaller than  $\frac{1}{2}$  horsepower or three-phase A.C. motors smaller than one (1) horsepower where manual control is specified may be furnished with starters of toggle switch or push button type with inbuilt thermal protection. No additional disconnecting means is required to be furnished with this type of starter. This type of starter may also be used in series with automatic control devices such as thermostats, float and pressure switches, provided the individual motor or the sum of fractional horsepower motors is less than  $\frac{1}{2}$  horsepower. Means for manual operation shall be provided.

D. DISCONNECTING BREAKER - All motor starters, unless otherwise specified shall be provided with a disconnecting means in the form of a circuit breaker of the type specified under "CIRCUIT PROTECTIVE DEVICES" of the General Conditions. This disconnecting means shall be contained in the same housing with the starter and shall be operable from outside. Means shall be provided for locking the handle of the circuit breaker in the "OFF" position if it is desired to take the equipment out of service and prevent unauthorized starting.

E. CONTROL CABINET - DRY LOCATIONS - all starters shall be furnished with general purpose, NEMA Type 1, sheet metal enclosures with hinged covers and baked enamel finish.

F. CONTROL CABINET - WATERTIGHT - In wet locations, cast iron watertight enclosures with threaded hubs, galvanized and gasketed hinged covers shall be provided.

G. 1. PANELS - Motor control devices and appliances shall be mounted on approved insulating slabs with all wiring and connections made on the back of the slabs.

2. WIRING AND TERMINALS - Wiring connections for currents of 100 Amperes or less may be made with copper wire or cable with special flameproof insulating coverings. Such wires shall be installed in a neat workmanlike manner, flat against the slab, and held in place by clips. Connections shall be made with pressure connectors for No. 8 AWG and larger wires, and with grommets for small stranded wires. Except for incoming and outgoing main leads, all connections shall terminate on approved connector blocks, which may be installed on the face of the slab. For small, across the line starters the above requirements may be modified if satisfactory connections are provided.

3. COPPER BUS - For currents exceeding 100 Amperes, copper bus shall be used in place of wires. The bus shall be constructed of copper rods, tubing or flat strap, bent and shaped properly and securely attached to the slab in a neat and workmanlike manner. The cross section of copper shall provide sufficient areas to keep current density at not more than 1,000 Amperes per square inch.

H. COOPERATION - The Contractors who furnish electrically operated equipment shall give to the Contractor for Electrical Work full information relative to sizes and locations of apparatus furnished by them which require electrical connections.

Equipment being installed by the Contractor for Electrical Work shall be delivered to the Contractor for Electrical Work by other Contractors in proper time and sequence so that the Contractor for Electrical Work shall be able to meet the Contractor for Electrical Work working schedule.

**I. SPARE PARTS**

1. FURNISH - Each Contractor shall furnish the following spare parts pertaining to equipment furnished by each Contractor.

One (1) set of contact fingers and springs and thermal elements for each three (3) (or fraction) of each size of magnetic contactor starter.

One (1) holding coil for each three (3) (or fraction) of each size of magnetic contactor starter.

2. WRAPPER MARKING - All parts shall be delivered to the Resident Engineer neatly wrapped and boxed and plainly tagged and marked for identification and reordering.

**PART K - SCHEDULE OF ELECTRICAL EQUIPMENT**

Schedule D requirements for electrical motor equipment may be included in one or more of the Specifications for the separate contracts for the Project. SCHEDULE D delineates the responsibilities of each separate contractor for electrical motor control equipment. SCHEDULE D is included in the Addendum to the General Conditions. In the event of any conflict between the Specifications and SCHEDULE D, SCHEDULE D shall take precedence; provided, however, in the event of an omission from SCHEDULE D (i.e., SCHEDULE D omits either a reference to or information concerning electrical motor equipment which is set forth in the Specifications), such omission from SCHEDULE D shall have no effect and the Contractor's obligation with respect to the electrical motor control equipment, as set forth in the Specifications, shall remain in full force and effect.

**1.38 Safety**

- A. Each Contractor shall provide and maintain all necessary temporary closures, guard rails, and barricades to adequately protect all workers and the public from possible injury. Any Contractor requiring removal of these items shall be responsible for the replacement of same.

**1.39 Interruption of Services and of Project Facilities**

- A. EVENING AND WEEKEND WORK - Where the work makes temporary shutdowns of the services unavoidable, they shall be made at night or on weekends or at such times that will cause no interferences with the established routines and operations of the projects in question.

1. Where weekend or evening work is required due to unavoidable service shutdowns, such work shall be performed at no extra cost to the City.

**B. INTERRUPTION OF PROJECT FACILITIES**

1. The Contractor shall not interrupt any of the services of the project nor interfere with these in any way without the permission of the Commissioner. Such interruption, or interferences, shall be made as brief as possible, and only at such time stated.
2. Under no circumstances will the Contractor, or its workers, be permitted to use any part of the project as a shop, without the permission of the Commissioner.
3. Unnecessary noise shall be avoided at all times and necessary noise shall be reduced to a minimum.
4. The facility operates 24 hours per day seven (7) days a week. Toilet facilities, water and electricity

must be operational at all times. No services of the project can be interrupted in any way without the permission of the Commissioner. Careful coordination of all work with the Resident Engineer must be done to maintain the operational level of the project personnel.

5. Contractors shall schedule their work to avoid noise interference that will affect the normal functions of the project. In particular, construction operations producing noises that are objectionable to the project functions will be scheduled at times of day or night, day of the week, or weekend, which will not interfere with the project personnel. Any additional cost resulting from this scheduling shall be borne by the specific Contractor.
6. The Contractor shall arrange to work continuously, including overtime, if required, to assure that services will be shut down only during the time actually required to make the necessary connections to the existing work.
7. The Contractor shall give ample written notice in advance to the Commissioner and project personnel of any required shutdown.

**1.40 Separation of Work Between Trades (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- A. SCHEDULE E – Requirements for various items of work are included in the Specifications for the separate contracts for the Project and in the General Conditions. Schedule E delineates the responsibilities of each separate contractor for various items of work, as well as the extent to which certain items involve coordination between trades. Schedule E is included in the Addendum to the General Conditions. The delineation set forth in Schedule E shall be taken as specific instruction to the Contractor that it is responsible for the listed items of work. Schedule E is not intended to limit the Contractor's responsibility for supervision and coordination as set forth in Paragraph B below. In the event of any conflict between the Specifications, the General Conditions and Schedule E, Schedule E shall take precedence; provided, however, in the event of an omission from Schedule E (i.e., Schedule E omits either a reference to or information concerning an item of work which is set forth in the Specifications or the General Conditions), such omission from Schedule E shall have no effect and the Contractor's obligation to perform the work, as set forth in the Specifications or the General Conditions, shall remain in full force and effect.
- B. SUPERVISION AND COORDINATION - Each Contractor is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate their installations.

**1.41 Shop Drawing and Material Samples Schedule**

- A. SCHEDULE F – Schedule F sets forth all submittal requirements for shop drawings and material samples. Schedule F is included in the Addendum to the General Conditions. At the kick-off meeting, each Contractor must review this Schedule with the Commissioner's Representative and the Consultant. Within 10 days after the kick-off meeting, the Contractor must complete information on Schedule F concerning the submission date, the required delivery date and the fabrication time. For all required submittals of shop drawings and material samples, the Schedule F provided by the Contractor must indicate a submission date which is at least 20 days prior to the date of the manufacture of the item or materials to be installed. In addition, if so directed by the Commissioner, the Schedule F provided by the Contractor must indicate a submission date for shop drawings and/or material samples of specified items or materials which is within 60 days after the kick-off meeting. In the event of any conflict between the Specifications and Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.
- B. COORDINATION - The Resident Engineer for this project will coordinate and review the data submitted by various Contractors. Upon acceptance by the Resident Engineer, the Resident Engineer

will date and sign the schedule as approved and transmit it to the Consultant, Contractors and Project Manager within the Department of Design and Construction.

- C. ARTICLE 11 - Thereafter, this schedule will be subject to the provisions of Article 11 of the agreement and must be strictly adhered to by the Contractor.

**1.42 Specific Requirements**

- A. The work of this article shall be the responsibility of the Contractor for General Construction Work, unless otherwise indicated.

**B. FIELD MEASUREMENTS**

1. Each Contractor shall verify all dimensions and conditions on the job so that all work will properly join the existing work.
2. Each Contractor, before commencing work, shall examine all adjoining work on which each Contractor's work is in any way dependent on good workmanship in accordance to the intent of the Specification and Contract Drawings. The Contractor shall report to the Commissioner any condition that will prevent any Contractor from performing work that is below the required standard.

**C. BORINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. REFERENCE DRAWINGS - The Boring Drawings as listed on the title sheet are for information to the bidder and are to be used under the conditions as follows:
2. BORING LOGS - shown on the Boring Drawings, record information obtained under engineering supervision in the course of exploration carried out by or under the direction of forces of the Department of Design and Construction at the site.
3. SOIL AND ROCK SAMPLES - All inferences are drawn from the indications observed as made by engineering and scientific personnel. All such inferences and all records of the work including soil samples and rock cores, if any, are available to bidders for inspection.
4. CERTIFICATION OF SAMPLES - The City certifies that the work was carried out as stated, and that the soil samples and rock cores, if any were referred to, were actually taken from the site at the times, places and in the manner indicated. The samples are available for inspection in the Department of Design and Construction Subsurface Exploration Section.
5. BIDDER'S RESPONSIBILITY - The bidder, however, is responsible for any conclusions to be drawn from the work. If the bidder accepts those of the City, it must do so at its own risk. If the bidder prefers not to assume such risk, the bidder is under the obligation of employing its own experts to analyze the available information, and must be responsible for any consequences of acting on their conclusions.
6. CONTINUITY NOT GUARANTEE - The City does not guarantee continuity of conditions shown at actual boring locations over the entire site. Where possible, borings are located to avoid all obstructions and previous construction which can be found by inspection of the surface and the bidder is required to estimate the influence of such features from its own inspection of the site.

**D. DEFERRED CONSTRUCTION**

1. Where necessity for deferred construction is certified by the Commissioner, in order to permit the installation of any item or items of equipment required to be furnished and installed under any other Contract in effect concurrent with the time allowed for doing and completing the work of the Contract, the Contractor shall defer construction work limited to adequate areas as approved by

the Commissioner.

2. The Contractor shall confer with the affected Contractors and ascertain arrangements, time and facilities necessary to be made by the Contractor in order to execute the provisions specified herein.

**E. WORK FENCE ENCLOSURE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. The Contractor shall furnish and erect a wood fence to the extent shown on the drawings enclosing the entire project on all sides. All materials used shall be new. Any permit required for the installation and use of said fence shall be borne by the Contractor.
2. THE FENCE shall be 7'-0" high with framing construction of yellow pine, using 4" x 4" posts on not more than 6'-0" centers, with three (3) rails of at least 2" x 4" size to which shall be secured boards, 3/4" x 6" tongue and groove, laid solid and surface and double nailed to each bearing. Posts shall be firmly fixed in the ground at least 30" and thoroughly braced. Top edge of fence shall be trimmed with a rabbeted edge mould. Provide on the street traffic sides of fence, observation openings as directed. The Contractor has the option of using 1/2" exterior grade plywood in lieu of the 3/4" x 6" tongue and groove boards.
3. GATES - Provide an adequate number of double gates, complete with hardware, located as approved by the Resident Engineer. Double gates shall have a total clear opening of 14'-0" with two (2) 7'-0" hinged swinging sections. Hanging posts shall be 6" x 6" and shall extend high enough to receive and be provide with tension or sag rods for the swinging sections.
4. PAINTING - The fence and gates shall be entirely painted on the street and public sides with two (2) coats of approved lead and oil paint. The below-grade section of the posts shall be first creosoted or given a coat of tar base paint. Black stenciled signs reading "POST NO BILLS" shall be painted on fence with three (3) inch high letters on 25 foot spacings for the entire length of fence on street traffic sides. Signs shall be stenciled five (5) feet above the sidewalk.
5. It shall be the obligation of the Contractor to remove all posters, advertising signs, and markings, etc., immediately.
6. Where sidewalks are used for "drive over" purposes for Contractor vehicles, a suitable wood mat or pad shall be provided for protection of sidewalks.
7. Where required, make provision for fire hydrants, lampposts, etc.
8. REMOVAL - When directed by the Resident Engineer, the fence shall be removed.

**F. PUMPING**

1. Furnish and install all necessary automatically operated pumps of adequate capacity with all required piping to run-off agencies, so as to maintain the excavation, cellar floor, pits and exterior depressions and excavations free from accumulated water during the entire period of construction and up to the date of final acceptance of work of the Contract.
2. All pumps shall be maintained at all times in proper working order.

**G. RESIDENT ENGINEER'S OFFICE**

**1. OFFICE SPACE IN EXISTING BUILDING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- a. The Resident Engineer will arrange for office space for sole use in the building where work is in progress. The Contractor for General Construction Work shall provide and install a lockset

for the door to secure the equipment in the room. The Contractor for General Construction Work shall provide two (2) keys to the Resident Engineer. After completion of the project the Contractor for General Construction Work shall replace the original lockset on the door and ensure its proper operation.

- b. The Contractor for General Construction Work shall provide one (1) telephone, where directed, for the exclusive use of the Resident Engineer. The Contractor for General Construction Work shall pay all costs for telephone service for calls within New York City limits for the duration of the project. The telephone service shall continue for a period of 90 days following substantial completion.
- c. The Contractor for General Construction Work shall provide the following equipment:
  - (1) Two (2) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Two (2) lockers, metal olive green or gray, single units, 15" x 18" x 78" overall including 6" legs. Lockers to have flat key locks with two (2) keys each, General Steel products or approved equal. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks approximately 52"H x 28 1/2"D x 18"W in a grey finish by Art Steel No. 2904L or approved equal.
  - (2) One (1) 9000 B.T.U. air conditioner or as directed by Commissioner. Wiring for the air conditioner shall be minimum No. 12 AWG fed from individual circuits in the fuse box.
  - (3) Two (2) metal wastebaskets, 13 inches square 15 inches high with rubber feet and corners by Art Metal Company No. 168 or approved equal.
  - (4) One (1) fire extinguisher one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
  - (5) One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the Contract as required.

**2. TRAILER OFFICE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

- a. The Contractor for General Construction Work shall provide at its own cost and expense a trailer and install and connect all utility services to trailer within twenty (20) days of start of work. The trailer shall have equipment having the minimum requirements hereinafter specified. Any permit required for the installation and use of said trailer shall be borne by the Contractor.
- b. The trailer shall remain the property of the Contractor for General Construction Work except that the file cabinets herein specified, shall become the property of the City of New York.
- c. Trailer shall be office type trailer of the following general minimum dimensions:
  - 1. Length, overall: 35 feet.
  - 2. Length, inside: 32 feet.
  - 3. Width, overall: 8 feet.
  - 4. Width, inside: 7 feet, 5 inches.
- d. Trailer shall be manufactured by International Trailer Company, Model No. 1 MU-35-D or Atlantic Trailer Corporation, Model No. F-36 or approved equal.
- e. The exterior of the trailer and the wheels shall be given an approved coat of exterior enamel. The enamel finish coat shall be DUPONT orange lacquer or approved equal. The trailer shall be lettered with black block lettering of the following heights with white borders:

CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES  
RESIDENT ENGINEER'S OFFICE

2-1/2"  
3-3/4"  
3-1/2"  
2-1/2"



NOTE: In lieu of painting letters on trailer the Contractor for General Construction Work may substitute a sign constructed of a good quality lumber with the same type and size of lettering above.

- f. All windows and doors shall have insect aluminum screens and wire mesh protective screening.
- g. The interior shall be finished in 1/4 inch plywood. Plywood shall be finished in natural color, with two (2) coats of varnish or lacquer.
- h. The interior shall be divided by partitions into one (1) large room in front of trailer, and a private office approximately 6' x 7' at rear of trailer and a washroom located adjacent to the private office.
- i. The washroom shall be equipped with a flush toilet, wash basin with two (2) faucets, medicine cabinet, complete with supplies by Hospital Supply and Watters Labs., Inc., Model No. 1 or approved equal and a toilet roll tissue holder. Plumbing and fixtures shall be approved house type, with each appliance trapped and vented and a single discharge connection. Five (5) gallon capacity automatic electric heater for domestic hot water shall be furnished.
- j. The heating system shall consist of thermostatically controlled electric baseboard heaters capable of delivering not less than 30,000 BTU per hour and heaters shall be as manufactured by Chromalox or approved equal, sized per area with individual approved thermostats.
- k. The trailer shall be equipped with an approved two-circuit, 110-120 volt armored cable wiring system of adequate capacity complete with entrance connector with provision for grounding, enclosed fused service switch and branch circuit fuse box. The circuits for lighting, water heater, heater and convenience outlets, etc. shall be two-conductor, No. 12. The circuits for the space heaters shall be sized minimum No. 12 wire led from individual circuits in the branch circuit fuse box. Metal boxes shall be provided at all outlet points. All wiring shall conform to the requirements of the Electrical Code of the City of New York for armored cable wiring systems.
- l. Lighting to be furnished by a minimum of four (4) 48 inch, single tube, fluorescent fixtures for the large rooms and an incandescent fixture for the washroom. Lighting fixtures shall be provided with built-in pull-chain switches. A minimum of six (6) duplex convenience outlets shall be installed; four (4) in the larger room and two (2) in the smaller room. These outlets shall be in addition to connections for electric space heaters and heaters for domestic hot water.
- m. In addition to the washroom and private office, the following shall be built-in to the trailer:
  - 1. The drafting or reference table at least 60 inches long by 36 inches wide with cabinet below, head shelf at each end of the trailer, wall type plan rack at least 42 inches wide and wardrobe opposite washroom.
- n. The following movable equipment shall be furnished:
  - 1. Four (4) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Four (4) lockers, metal olive green or gray, single units, 15" x 18" x 78" overall including 6" legs. Lockers to have flat key locks with two (2) keys each, General Steel products or approved equal. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks approximately 52" H x 28 1/2" D x 18"W in a grey finish by Art Steel No. 2904L or approved equal.
  - 2. One (1) 6000 B.T.U. and one (1) 9000 B.T.U. air conditioner. Wiring for the air conditioners shall be minimum No. 12 AWG fed from individual circuits in the fuse box.

3. Two (2) metal wastebaskets, olive green or grey finish, 13 inches square 15 inches high with rubber feet and corners by Art Metal Company No. 168 or approved equal.
  4. One (1) fire extinguisher one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
  5. One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the Contract as required.
- o. TRAILER TEMPORARY SERVICE - Plumbing and electrical work required for the trailer will be furnished and maintained as below.
1. PLUMBING WORK - shall include all water supply and drainage piping required for a complete installation. Contractor to provide a temporary water service from the City's water main and extend in the trailer and properly connect up all fixtures requiring water supply. Provide all necessary soil, waste, vent and drainage piping.
    - a. Plumbing Contractor to frost-proof all water pipes to prevent freezing.
    - b. REPAIRS, MAINTENANCE - The Plumbing Contractor provide repairs when and as required for a period of thirty (30) days after the date of substantial completion acceptance.
    - c. DISPOSITION OF PLUMBING WORK - At the expiration of the time limit set forth in Subparagraph 3, the water drainage connections and piping to the office trailer shall be removed and shall be plugged at the mains. All piping shall become the property of the Contractor for Plumbing Work and shall be removed from the site, all as directed. All repair work due to these removals shall be the responsibility of the Contractor for General Construction Work.
  2. ELECTRICAL WORK - The Contractor for Electrical Work shall furnish, install and maintain a temporary electric feeder to the trailer to be used by the Resident Engineer immediately after it is placed at the job site.
    - a. The temporary electric feeder shall be at least three (3) No. 6RH wire and shall be protected by a 60 Ampere fused safety switch, complying with codes and utility requirements having jurisdiction.
    - b. Make all arrangements and pay all costs to provide electric service.
    - c. Pay all costs for current consumed and for maintenance of the system in operating condition, including the furnishing of the necessary bulb replacements lamps, etc., for a period of thirty (30) days after the date of substantial completion acceptance.
    - d. Disposition of Electric Work: At the expiration of the time limit set forth, the temporary feeder, safety switch, etc., shall be removed and disposed of as directed.
    - e. All repair work due to these removals shall be the responsibility of the Contractor.
- p. MAINTENANCE
1. The Contractor for General Construction Work shall provide and pay all costs for hot and cold water, heat and fuel and regular daily janitor service. Furnish toilet paper, cloth towels and soap and maintain the field office in first-class condition, including all repairs, until 30 days after the date of substantial completion acceptance.
  2. Provide fire, extended coverage and vandalism, malicious mischief and burglary and theft

insurance coverage for the Resident Engineer's field office equipment in the amount of \$10,000. All insurance coverage shall be provided by a company licensed and authorized to do business in the State of New York. Such coverage must, under the loss payable clause or by endorsement thereon, state the following: "loss, if any, payable to the City of New York."

3. At 30 days after the date of substantial completion acceptance, or sooner as directed by the Commissioner, the Contractor for General Construction Work shall have all services disconnected and capped to the satisfaction of the Resident Engineer.
- q. The Contractor for General Construction Work shall provide and pay all costs for the following telephone services for the Resident Engineer's trailer:
  1. Two (2) desk phones
  2. One (1) wall phone (with six (6) foot extension cord) at plan table.
  3. A remote bell located on outside of trailer
  4. The telephone service shall continue for a period of 90 days following substantial completion.
- r. Should it become necessary to relocate the trailer or move the field office from one (1) location to another, Contractor for General Construction Work shall be responsible for move or moves and of reconnecting all utilities described above at new location, and shall assume all costs incurred.
- s. PERMITS - The Contractor for General Construction Work shall make the necessary arrangements and obtain all permits required for this work.
- t. The Contractor for General Construction Work has the option of providing, at its cost and expense, rented office or store space in lieu of trailer. Said space shall be in the immediate area of the Project and have adequate plumbing, heating and electrical facilities. Space chosen by the Contractor for General Construction Work must be approved by the Commissioner before the area is rented. All insurance maintenance and equipment required for trailer field office shall also apply to rented spaces.

**H. ADDITIONAL EQUIPMENT FOR THE RESIDENT ENGINEER (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. The Contractor for General Construction Work shall supply photo equipment not to exceed \$250. Said equipment to be specified by Resident Engineer. At the completion of the project, the equipment shall become the property of the City of New York.
2. The Contractor for General Construction Work shall provide a copy machine for paper sizes 8½ x 11 & 8½ x 14. Copier shall remain at job site 30 days beyond the Substantial Completion date.
3. The Contractor for General Construction Work shall furnish a fax machine and a telephone answering machine at commencement of the project. All materials shall be new, sealed in manufacturer's original packaging and shall have manufacturers' warranties. All items shall remain the property of the City of New York at the completion of the project.
4. Computer Workstation (Refer to the Addendum to the General Conditions for the number of Computer Workstations to be provided):

Computers shall be provided for all contracts that have a total duration of 180 Consecutive Calendar Days (CCDs) or more, as set forth in Schedule "A". Contracts that have a total duration of less than 180 CCDs shall not require computers. Computer workstations shall be provided for

the duration of the contract.

(1) Personal Computer(s) - Workstation Configuration.

- (a) Make and Model: Dell, Gateway, Toshiba, HP, IBM, or an approved equal. (Note: an approved equal requires written approval of the Assistant Commissioner of ITS.)
- (b) Processor: 3.0 GHz Pentium 4 or faster computer - Single Processor.
- (c) System RAM: Minimum of 1 GB (Gigabytes) of SDRAM or DDR.
- (d) Hard Disk Drive(s): 80 GB (Gigabytes) or larger.
- (e) CD-RW: Internal CD-RW, 48x Speed or faster.
- (f) 16xDVD+/RW: DVD Burner (with double layer write capability) 16x Speed or faster
- (g) I/O Ports: Must have at least one (1) Serial Port one, (1) Parallel Port, 2 USB Ports. Serial Ports must consist of UART 16550 Chip or better.
- (h) Video Display Card: PCI Interface with a minimum of 64 MB of RAM.
- (i) Monitor: 17" TFT LCD monitor.
- (j) Available Exp. Slots: System as configured above shall have at least two (2) full size PCI Slots available.
- (k) Fax/Modem: Internal Fax/Modem 56 Kbps speed, featuring 3COM or US Robotics Chipset and supporting a minimum of V.92 and MNP5 compliant. Integrated 10/100/1000 Ethernet.
- (l) Other Peripherals: Optical scroll Mouse, 101 Key Keyboard, Mouse Pad and all necessary cables.
- (m) Software Requirements: Microsoft Windows XP Professional, Microsoft Office 2003 Professional, Microsoft Project 2002 Professional, Adobe Acrobat reader, Anti-Virus software package with one year updates subscription, Win Zip and Auto Cad 2008 LT.

(2) All field offices requiring computers shall be provided with the following:

- (a) One (1) broad-band internet service account. This account will be active for the life of the project.
- (b) One (1) 600 DPI HP Laser Jet Printer (twelve (12) pages per minute or faster) with one (1) Extra Paper Tray (Legal Size)
- (c) All necessary Cabling
- (d) Storage Boxes for and Blank CDs/DVDs
- (e) Printer Table
- (f) UPS/Surge Suppressor combo

(3) All Computer Hardware shall come with a three (3) year warranty for on-site repair or replacement. Additionally, and notwithstanding any terms of the warranty to the contrary, the Contractor is responsible for rectifying all computer problems or equipment failures within one (1) business day.

- (4) An adequate supply of blank CD's/DVD's, and paper and toner cartridges for the printer shall be provided by the Contractor, and shall be replenished by the Contractor as required by the Engineer.
- (5) It is the Contractor's responsibility to ensure that electrical service and phone connections are also available at all times; that is, the Field Office Computer(s) is to be powered and turned on twenty four (24) hours each day.

Broadband connectivity is preferred at each field office location. Please take into consideration that an extra phone line dedicated to the modem must be ordered as part of the contract unless Internet broadband connectivity, via Cable or DSL, is available at the planned field office location. Any questions regarding this policy should be directed to Raul Canabal, Assistant Commissioner of Information Technology Services at 718-391-1668.

**I. PUBLIC TELEPHONE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. The Contractor shall provide a public telephone located on the site, where directed, for the duration of the Contract.

**J. HEAD PROTECTION (HARD HATS)**

1. The Contractor shall provide a minimum of 10 standard protective helmets for the exclusive use of Department of Design and Construction personnel and their visitors. Helmets shall be turned over to the Resident Engineer and kept in the office of the Resident Engineer.
2. Upon completion of the project, the helmets shall become the property of the Contractor.

**K. RODENT AND INSECT CONTROL**

1. **DESCRIPTION** - The General Contractor shall provide all labor, materials, plant and equipment, and incidentals required to survey and monitor rodent activity and to control any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. Special attention should be paid to the following conditions or areas:
  - a. Wet areas within the project area, including all temporary structures.
  - b. All exterior and interior temporary toilet structures within the project area.
  - c. All Field Offices and shanties within the project area of all Contractors and the Department of Design and Construction (DDC).
  - d. Wherever there is evidence of food waste and/or discarded food or drink containers, in quantity, that would cause breeding of rodents or the insects herein specified.
  - e. Any other portion of the premises requiring such special attention.
2. **MATERIALS:** All materials shall be approved by the New York State Department of Environmental Conservation and comply with the New York City Health Code, OSHA and the laws, ordinances and regulations of State and Federal agencies pertaining to such chemical and/or materials
3. **PERSONNEL:** All pest control personnel must be supervised by an exterminator licensed in categories 7A & 8.
4. **METHODS**

- a. Application and dosage of all materials shall be done in strict compliance with the manufacturer's recommendations.
- b. Under the Maintenance of Site item (section 1.42.L), any unsanitary conditions, such as uncollected garbage or debris, resulting from the General Contractor's activities which will provide food and shelter to the resident rodent population shall be corrected by the General Contractor immediately after notification of such condition by the Commissioner.

#### 5. RODENT CONTROL WORK

- a. In wetlands, woodlands and areas adjacent to a stream, special precautions must be taken to protect water quality and to ensure the safety of other wildlife. To prevent poisoned bait from entering streams, no poisoned bait shall be used in areas within seventy-five (75) feet of all streambanks. Live traps must be used in these seventy-five (75) foot buffer zone areas and within wetland and woodland areas.
- b. In areas outside the seventy-five (75) foot zone of protection adjacent to streams, and in areas outside wetlands and woodlands, tamper proof bait stations with poisoned bait shall be placed during the period of construction and any consumed or decomposed bait shall be replenished as directed.
- c. At least one month prior to initiation of the construction work, and periodically thereafter, live traps and/or rodenticide bait in tamper proof bait stations, as directed above, shall be placed at locations that are inaccessible to pets, human beings, children and other non-target species, particularly wildlife (for example-birds) in the project area.
- d. The General Contractor shall be responsible for collecting and disposing of all trapped and poisoned rodents found in live traps and tamper proof bait stations. The General Contractor shall also be responsible for posting and maintaining signs announcing the baiting of each particular location.

The General Contractor, under his/her Maintenance of Site operations, shall be responsible for the immediate collection and disposal of any visible rodent remains found on streets or sidewalks within the project area.

- e. It is anticipated that public complaints will be addressed to the Commissioner. The General Contractor, where directed by the Commissioner, shall take appropriate actions, like baiting, trapping, proofing, etc., to remedy the source of complaint within the next six (6) hours of normal working time which is defined herein for the purposes of this section as 7 A.M. to 6 P.M. on Mondays through Saturdays.
- f. Emergency service during the regular workday hours (Monday through Friday) shall be rendered within 24 hours, if requested by the Commissioner, at no additional cost to the City.

#### 6. EDUCATION & TRAINING

- a. The General Contractor shall post notices on all Construction Bulletin Boards advising workers, employees, and residents to call the Engineer's Field Office to report any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. The General Contractor shall provide and distribute literature pertaining to IPM techniques of rodent control to affected businesses and superintendents of nearby residential buildings to ensure their participation in maintaining their establishments free of unsanitary conditions, harborage removal and rodent proofing.
- b. Prior to application of any chemicals, the General Contractor shall furnish to the Commissioner copies or sample labels for each pesticide, antidote information, and Material Data Safety Sheets (MSDS) for each chemical used.

## 7. RECORDS AND REPORTS

- a. The General Contractor shall keep a record of all rodent and waterbug infestation surveys conducted by him/her and make available, upon request, to the Commissioner. The findings of each survey shall include, but not be limited to, recommended Integrated Pest Management (IPM) techniques, like baiting, trapping, proofing, etc., proposed for rodent and waterbug pest control.
- b. The General Contractor shall maintain records of all locations baited along with the type and quantity of rodenticide and insecticide bait used.

## L. SITE SECURITY/PERIMETER SIGNAGE

1. In order to properly convey notice to persons entering upon a City construction site, the Contractor shall furnish and install a sign at the entrance (gates) as follows:

---

**NO TRESPASSING**

**AUTHORIZED PERSONNEL ONLY**

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2. If no construction fence exists at the site, this notice shall be conveyed by incorporating the above language into safety materials (barriers, tape, and signs).

## M. MAINTENANCE OF SITE AND ADJOINING PROPERTY

1. Take over and maintain the site, after order to start work.
2. Until the work of the Contract is completed and accepted, the Contractor shall be responsible for the safety of the adjoining property, including sidewalks, paving, fences, sewers, water, gas, electric and other mains, pipes and conduits etc. The Contractor shall, at its own expense, except as otherwise specified, protect same and maintain them in least as good a condition as that in which the Contractor finds them.
3. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained and repaired to serviceable condition with materials to match existing.
4. Provide and keep in good repair all bridging and decking necessary to maintain vehicular and pedestrian traffic.
5. The Contractor shall also remove all snow and ice as it accumulates on the sidewalks within the Contract Limits Lines.

## N. SAFETY PRECAUTIONS FOR CONTROL CIRCUITS

1. Control circuits, the failure of which will cause a hazard to life and property, shall comply with the New York City Dept. of Buildings, Bureau of Electrical Control requirements.

## O. OBSTRUCTIONS IN DRAINAGE LINES

1. The Contractor shall be responsible for all obstructions occurring in all drainage lines, fittings and fixtures after the installations and cleaning of these drainage lines, fittings and fixtures as certified by the Resident Engineer. Roof drains shall be kept clear of any and all debris. Any stoppage shall be repaired immediately at the expense of the Contractor for General Construction Work.

## P. MAINTENANCE OF PROJECT SITE

1. Take over and maintain all project areas, after order to start work.
2. Until the work of the Contract is completed and accepted, the Contractor shall be responsible for the safety of all project areas, including water, gas, electric and other mains and pipes and conduits and shall at the Contractor's own expense, except as otherwise specified, protect same and maintain them in at least as good condition as that in which the Contractor finds them.
3. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained, and if damaged, repaired to serviceable conditions with materials to match existing.
4. The Contractor shall keep the space for the Resident Engineer in a clean condition.

Q. PROJECT SIGN AND RENDERING  
PART A – PROJECT SIGN

1. Responsibility: The Contractor shall produce and install one (1) project sign which shall be posted and maintained upon the site of the project at a point and in a position where directed by the Commissioner. The Contractor shall protect the sign from damage during the continuance of work under the Contract and shall do all patching of lettering, painting and bracing thereof necessary to maintain same in first class condition and in proper position. Prior to fabrication, contractor shall submit an 8-1/2" x 11" color match print proof from the sign manufacturer of completed sign for approval by the Commissioner.
2. Sign Quality: The Contractor shall provide all materials required for the production of the sign as specified herein. Workmanship shall be of the best quality, free from defects and shall be produced in a timely manner.
3. Schedule: Upon project mobilization, the Contractor shall commence production and installation of the sign.
4. Removal: At the completion of all work under the Contract, the Contractor shall remove and dispose of the project sign away from the site.
5. Sign construction:
  - a. Frame: The frame shall be from quality dressed 2"x2" pine, fire retardant, pressure treated lumber, that surrounds the inside back edge of the sign. The sign shall have one (1) intermediate vertical and two (2) diagonal supports, glued and screwed for rigidity. Frame shall be painted white with two (2) coats of exterior enamel paint, prior to mounting of sign panel.
  - b. Edging: U-shaped, 22 gauge aluminum edging, with a white enameled finish to match sign background, shall run around entire edging of sign panel and frame. Corners shall be mitered for a tight fit. Channel dimensions shall be 1" inch (overlap to sign panel face) x 1 3/4" (or as required across frame depth) x 1" (back overlap).
  - c. Sign Panel: 4' x 8' panel shall be constructed in one (1) piece of 14 gauge (.0785") 6061-T6 aluminum. This panel shall be prefinished both sides with a glossy white baked-on enamel finish and be flush with edge of 2" x 2" wood frame. Samples must be submitted for approval.
  - d. Fastening: Fasten sign panel to wood frame using cadmium plated no. 8 sheet metal screws at 1/2" below edge of panel and 8" on center. The U-shaped aluminum channel shall be applied over the wood frame edge and fastened with cadmium plated no. 8 sheet metal screws at 12" on center around the entire perimeter.
6. Sign Graphics:
  - a. All visual components of the sign are in an Adobe \*.pdf file, which is provided by the



Commissioner's representative. The file is to be opened in Acrobat Professional or Acrobat Approval in order to be saved with project information. The Commissioner's representative shall insert the project name and names and titles of personnel (3 or more) and any other required information associated with the project. At no point in the update, saving or renaming of the file should it be locked by any user. The digital file shall be provided by DDC to the Contractor (on a CD or via E-mail) for printing.

- b. The DDC \*.pdf file with names provided by the commissioner shall be reproduced at the Sign Panel size of 4' x 8' on 3M High Performance Vinyl or approved equal. The sign manufacturer is required to print from the Acrobat \*.pdf provided, and must match the following colors specified by Pantone: 3025 C, 119 C, 131 C, 1805 C, 1817 C in their exact locations as indicated in the \*.pdf file, and on the DDC website: [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc).
- c. Color shall be created in a four-color process to reproduce Pantone Colors (per Pantone formula).
  1. Pantone color 3025 C (C-100, M-17, Y-0, K-51).
  2. Pantone color 119 C (C-0, M-12, Y-100, K-49).
  3. Pantone color 131 C (C-0, M-32, Y-100, K-23).
  4. Pantone color 1805 C (C-0, M-91, Y-100, K-23).
  5. Pantone color 1817 C (C-0, M-90, Y-100, K-66).

The typeface, Helvetica shall be used in all text-fields as is specified in the settings of the Acrobat \*.pdf.

Note: 3M High Performance Vinyl or equivalent shall be guaranteed for nine (9) years. Guarantee must cover fading, peeling, chipping or cracking.

**PART B – PROJECT RENDERING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. Responsibility: In addition to the Project Sign, the Contractor shall furnish and install one (1) sign showing a rendering of the project. From an approved image file provided by the DDC, the Project Rendering is to be sized, printed, and mounted in an identical manner as described in Part A above for the Project Sign. Any area of the 4' X 8' panel area not filled by the rendering shall be printed in Pantone color 3025 (c-100, M-17, y-0, K-51). A color match print proof from the sign manufacturer of the Rendering Sign printed from the supplied file is to be submitted to DDC for approval before fabrication. The Rendering Sign is to be posted at the same height as the Project Sign. Where possible, the Rendering Sign shall be mounted with a perfect match of the short sides of the rectangle so that the Rendering Sign and the Project Sign together will create one long rectangle.
2. Removal: At the completion of all work under the Contract, the Contractor shall remove and dispose of the project rendering away from the site.

**R. PLANT PEST CONTROL REQUIREMENTS and TREE PROTECTION REQUIREMENTS**

1. Plant Pest Control Requirements: The Contractor for General Construction Work (the "Contractor") and its subcontractors, including the Certified Arborist described below, shall comply with all Federal and New York State laws and regulations concerning Asian Longhorned Beetle (ALB) management, including protocols for ALB eradication and containment promulgated by the New York State Department of Agriculture and Markets (NYSDAM). The Contractor is referred to: (1) Part 139 of Title 1 NYCRR, Agriculture and Markets Law, Sections 18, 164 and 167, as amended, and (2) State Administrative Procedure Act, Section 202, as amended.

- a. All tree work performed within the quarantine areas must be performed by New York State Department of Agriculture and Markets (NYSDAM) certified entities. Transportation of all host material, living, dead, cut or fallen, inclusive of nursery stock, logs, green lumber, stumps, roots, branches and debris of a half inch or more in diameter from the quarantine areas is prohibited unless the Contractor or its sub contractor performing tree work has entered into a compliance agreement with NYSDAM. The terms of said compliance agreement shall be strictly complied with. Any host material so removed shall be delivered to a facility approved by NYSDAM. For the purpose of this contract host material shall be ALL species of trees.
  - b. Any host material that is infested with the Asian Longhorned Beetle must be immediately reported to NYSDAM for inspection and subsequent removal by either State or City contracts, at no cost to the Contractor.
  - c. Prior to commencement of tree work, the Contractor shall submit to the Commissioner a copy of a valid Asian Longhorned Beetle compliance agreement entered into with NYSDAM and the Contractor or its sub contractor performing tree work. If any host material is transported from the quarantine area the Contractor shall immediately provide the Commissioner with a copy of the New York State 'Statement of Origin and Disposition' and a copy of the receipt issued by the NYSDAM approved facility to which the host materials are transported.
  - d. Quarantine areas, for the purpose of this contract shall be defined as all five boroughs of the City of New York. In addition, prior to the start of any tree work, the Contractor shall contact the NYC Department of Parks & Recreation's Director of Landscape Management at (718) 699-6724, to determine the limits of any additional quarantine areas that may be in effect at the time when tree work is to be performed. The quarantine area may be expanded by Federal and State authorities at any time and the Contractor is required to abide by any revisions to the quarantine legislation while working on this contract. For further information please contact: NYSDAM (631) 288-1751.
2. Tree Protection Requirements: The Contractor shall retain a Certified Arborist, as defined by New York City Department of Parks and Recreation (NYCDPR) regulations, to provide the services described below.
- a. Surveys and Reports: The Certified Arborist shall, at the times indicated below, conduct a survey and prepare a plant material assessment report which includes: (1) identification, by species and pertinent measurements, of all plant material located on the project site, or in proximity to the project site, as described below, including all trees, significant shrubs and/or planting masses; (2) identification and plan for the containment of plant pests and pathogens, including the ALB, as described above; (3) evaluation of the general health and condition of any infected plant material.
  - b. Frequency of Reports: The Certified Arborist shall conduct a survey and provide a plant material assessment report at two (2) points in time: (1) prior to the commencement of construction work; and (2) at the time of substantial completion. In addition, for projects exceeding 24 months in duration, the Certified Arborist shall conduct a survey and prepare a report at the midpoint of construction. Copies of each plant material assessment report shall be submitted to the Resident Engineer within two (2) weeks of the survey.
  - c. Proximity to Project Site: Off-site trees, significant shrubs and/or planting masses shall be considered to be located in proximity to the project site under the circumstances described below.
    1. The tree trunk, significant shrub, or primary cluster of stems in a planting mass is within 50 (fifty) feet of the project's Contract Limit Lines (CLLs) or Property Lines (PLs).
    2. Any part of the tree or shrub stands within 50 (fifty) feet of: (a) a path for site access for vehicles and/or construction equipment; or (b) scaffolding to be erected for construction

activity, including façade remediation projects.

3. The Certified Arborist determines that the critical root zone (CRZ) of an off-site tree, significant shrub, or primary cluster of stems in a planting mass extends into the project site, whether or not that plant material is located within the 50-foot inclusionary perimeter as outlined above.
- d. Tree Protection Plan: The Certified Arborist shall prepare, and the Contractor shall implement, a Tree Protection Plan, for all trees that may be affected by any construction work, excavation or demolition activities, including without limitation, (1) on-site trees, (2) street trees, as defined below, (3) trees under NYCDPR jurisdiction as determined by the Department of Transportation, and (4) all trees that are located in proximity to the project site, as defined above. The Tree Protection Plan shall comply with the NYC DPR rules, regulations and specifications. The Contractor is referred to Chapter 5 of Title 56 of the Official Compilation of the Rules of the City of New York. Copies of the Tree Protection Plan shall be submitted to the Resident Engineer prior to the commencement of construction. Implementation of the Tree Protection Plan for street trees and trees under NYCDPR jurisdiction shall be in addition to any tree protection requirements specified or required for the project site.  
For the purpose of this article, a "street tree" means the following: (1) a tree that stands in a sidewalk, whether paved or unpaved, between the curb lines or lateral lines of a roadway and the adjacent property lines of the project site, or (2) a tree that stands in a sidewalk and is located within 50 feet of the intersection of the project's site's property line with the street frontage property line.
3. No Separate Payment. No separate payment shall be made for compliance with Plant Pest Control Requirements or Tree Protection Requirements. The cost of compliance with Plant Pest Control Requirements and Tree Protection Requirements shall be deemed included in the Contractor's bid for the Project.







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**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF BUILDINGS**

30-30 THOMSON AVENUE  
TELEPHONE (718) 391-1000

LONG ISLAND CITY, NEW YORK 11101-3045  
WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

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**Contract for Furnishing all Labor and Material Necessary**

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Contractor

Dated \_\_\_\_\_, 20\_\_\_\_

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Approved as to Form  
Certified as to Legal Authority

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Acting Corporation Counsel

Dated \_\_\_\_\_, 20\_\_\_\_

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Entered in the Comptroller's Office

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First Assistant Bookkeeper

Dated \_\_\_\_\_, 20\_\_\_\_



FMS ID: S216-399A



**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS**

30-30 THOMSON AVENUE LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000 WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 GENERAL CONSTRUCTION WORK

**Southwest Brooklyn Marine Transfer  
Station - Building Construction**

LOCATION: 1824 Shore Parkway  
BOROUGH: Brooklyn 11214  
CITY OF NEW YORK

PRISMATIC DEVELOPMENT CORP.  
Contractor

Dated FEBRUARY, 20 14

Approved as to Form  
Certified as to Legal Authority

[Signature]  
Acting Corporation Counsel

Dated July 27, 20 12

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated \_\_\_\_\_, 20 \_\_\_\_\_









PROJECT ID:

S216-399A

**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
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30-30 THOMSON AVENUE  
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**LAW**

**VOLUME 3 OF 3**

**ADDENDUM TO THE GENERAL  
CONDITIONS**

**SPECIFICATIONS**

FOR FURNISHING ALL LABOR AND MATERIALS  
NECESSARY AND REQUIRED FOR:

**Southwest Brooklyn Marine Transfer  
Station - Building Construction**

LOCATION:  
BOROUGH:  
CITY OF NEW YORK

1824 Shore Parkway  
Brooklyn 11214

CONTRACT NO. 1

GENERAL CONSTRUCTION WORK

New York City Department of Sanitation

Greeley & Hansen LLC

Date:

July 10, 2012



**2-112**



# ADDENDA CONTROL SHEET

**TITLE: Southwest Brooklyn Marine Transfer Station – Building Construction**

9-12-2012

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

September 12, 2012

**ADDENDUM No. # 1**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for September 27, 2012, at 2:00 pm is rescheduled to October 11, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to the Bid Booklet:**

See Attachment B.

4. **Revisions to Specifications:**

See Attachment C.

5. **Revisions to Drawings:**

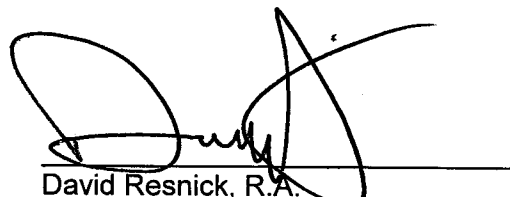
See Attachment D.

6. **Revisions to the Addendum to the General Conditions:**

See Attachment E.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.



David Resnick, R.A.  
Deputy Commissioner

\_\_\_\_\_  
Name of Bidder

By: \_\_\_\_\_

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT A – BIDDERS QUESTIONS AND RESPONSES TO QUESTIONS**

No.	Bidders' Questions	DDC Responses
1	<p>There is a note on Drawing A-118 referencing intumescent mastic on the upper lidding room beams and to reference Note No. 12 on Drawing A-500.</p> <p>Note No. 12 on A-500 does not exist. Please provide correct reference note.</p>	<p>Drawing A-500 is modified by Addendum No. 1 to show the missing notes. See Attachment D, Revisions to Drawings.</p>
2	<p>Schedule A specifies that no more than 60% of the project can be sub-contracted. On a project of this magnitude the percentage of work to be sub-contracted is typically between 80% to 90%. Can you advise if the subcontracting limit requirements can be either eliminated or increased to a more practical percentage?</p>	<p>The allowable subcontractor work has been changed to 80 percent. See Attachment E, Revisions to the Addendum to the General Conditions.</p>
3	<p>Please provide pre-bid info and any other bidding information, thanks.</p>	<p>Project pre-bid information and other bidding information is available for download on DDC's website, or is available as noted in Attachment 1 – Bid Information at DDC Contract Section, 30-30 Thomson Avenue – First Floor, Long Island City, NY 11101.</p>
4	<p><b>Drawing Reference: C-019 and A-900.</b> Can you please clarify the extent of ornamental fencing - Specification 02822? Drawing C-016 identifies a 10 ft high chain link fence along the perimeter of the parking lot which appears to travel along the pedestrian sidewalk to the main entry area. On Drawing A-900 at the main entry area, there is a note for an open grille fence near the entry to the pedestrian sidewalk from the entry gates.</p> <p>Is this area the extent of the ornamental fencing or does the ornamental fencing follow the pedestrian sidewalk and stop at the area where the outboard vehicle scale is located?</p>	<p>Drawing A-900 is clarified by Addendum # 1. See Attachment D, Revisions to Drawings.</p>

No.	Bidders' Questions	DDC Responses
5	<p>We respectfully request an immediate four (4) week extension of the current bid date, Monday 9/27/12, to Tuesday, 10/25/12. This request is being made to allow sufficient time for us to solicit as many proposals as possible from the many Specialty Subcontractors and Suppliers needed for a Project of this type. This additional time will allow us to prepare an accurate and competitive bid.</p> <p>We thank you in advance for your consideration of this request.</p>	<p>The Bid Opening date is revised to October 11, 2012.</p>
6	<p>Is there a time preferably next week we can schedule for a secondary walk-through so that our sub-contractors may see the site?</p>	<p>No secondary walk-through will be scheduled.</p>
7	<p><b>Final Utilities</b> On Sheet C027.00, the Storm Sewer pipe from ST MH-9 &amp; ST MH-11 changes in size from 18" to 27". Please clarify the size of the pipe.</p>	<p>Drawing C-027 will be revised in Addendum #2.</p>
8	<p><b>Final Utilities</b> On Sheet C028.00, the note for the 2" HP gas pipes states, "2' HP GAS SERVICE TO BE INSTALLED BY KEYSpan, TRENCHING PROVIDED BY CONTRACTOR FOR CONTINUATION SEE FINAL UTILITIES OVERALL PLAN DWG." However on sheet C028.00, the gas service line is shown as 4" LP Gas pipe. Is this pipe also to be installed by Keyspan, trenching provided by the contractor? If not please clarify if the pipe size is 2" or 4".</p>	<p>Drawing C-028 will be revised in Addendum #2. This note will be deleted from the drawing.</p>
9	<p><b>Final Utilities</b> On Sheet C027.00, the 10" Sanitary Pipe from SMH-7 to SMH-8 is shown to slope towards SMH-8. Similarly, the 12" sanitary pipe from SMH-8 to SMH-9 slopes towards SMH-8. Please clarify the direction of flow.</p>	<p>Drawing C-027 will be revised in Addendum #2. Flow will be redirected from SMH-8 toward SMH-9.</p>
10	<p><b>Final Utilities</b> On Sheet C028.00, the Storm Sewer pipes from ST MH-7 to ST MH-4 &amp; ST MH-4 to ST MH-3 do not have a size associated with them. Please clarify the size of the pipe.</p>	<p>Drawing C-028 will be revised in Addendum #2.</p>

No.	Bidders' Questions	DDC Responses
11	<b>Final Utilities</b> On Sheet C028.00, the pipe size is not labeled. This occurs often on short runs from the CBs. We assume them to be 12". Is this correct?	Drawing C-028 will be revised in Addendum #2. Sewer lines connecting catch basins to stormwater manholes are 12-inch diameter.
12	<b>Final Utilities</b> On Sheet C028.00, the storm sewer pipe from ST MH-6 to ST MH-7 is labeled 16". We do not know of 16" concrete pipe. Is this supposed to be 18"?	Drawing C-028 will be revised in Addendum #2.
13	<b>Final Utilities</b> On Sheet C027.00, storm sewer pipe from ST MH-14 to ST MH-13, should the flow be reversed?	Drawing C-027 will be revised in Addendum #2.
14	<b>Final Utilities</b> On Sheet C028.00, the Stormwater Treatment System 1 occupies the same plan space as EMH-2. Please clarify.	Drawing C-028 will be revised in Addendum #2. EMH-2 will be relocated away from Stormwater Treatment System 1 toward EMH-1.
15	<b>Final Utilities</b> On Sheet C026.00, what is the structure that ST MH-15 & ST MH-16 connect to with 10" pipes?	Drawing C-026 will be revised in Addendum #2. The structure is Stormwater Treatment Unit 3. Additional details will be provided in Addendum #2.
16	<b>10" Storm Sewer Pipe on Sketch RRC-RFI-003 (attached)</b> 1. This 10" Storm Sewer Pipe shows up quite often. There is no reinforced concrete for 10" size. Please provide type of pipe and spec.	Per the schedule in Section 02503 Installation of Buried Piping, material is Ductile Iron for 6" to 10" Storm Sewer pipe. Specifications for ductile iron pipe can be found in Section 15051 Ductile Iron Pipe.
17	<b>Final Utilities</b> Note 5 on Sheets C-026 & C-027 states, "FOR ADDITIONAL DETAILS ON BILGE WATER COLLECTION PIPING, SEE MECHANICAL PIER LEVEL DRAWINGS". There is not bilge water collection info on Mech. Pier Level drawings. Please advise where to find it.	Drawings C-026 and C-027 will be revised in Addendum #2. Note will be revised to "FOR ADDITIONAL DETAILS ON BILGE WATER COLLECTION PIPING SEE CIVIL SITE WORK DETAILS".
18	<b>Final Utilities (Regarding the Storm Manhole Schedule on Dwg C-030)</b> 1. Please help us find the location of STS 3, and please help us find a detail for STS 3.  2. ST MH-16 is nowhere near STS2. Please advise correction.	1. Drawing will be revised in Addendum #2. Location of stormwater treatment unit three is shown at the box to the northwest corner of the pier. A detail drawing of this unit will be provided in Addendum #2.  2. Drawing will be revised in Addendum #2. A revised storm manhole schedule will be provided in Addendum #2.



No.	Bidders' Questions	DDC Responses
	3. It appears that ST MH-12 is branch to STS 2, not STS 3. STS 3 is still missing in action.	3. Drawing will be revised in Addendum #2.
19	<b>Final Utilities (Refer to Sketch RRC-RFI-006-Q-4-5)</b> This 18" ST slope direction seems incorrect. Please advise	4. Drawing C-027 will be revised in Addendum #2. The direction of the slope shown on the drawing is incorrect. The direction of the slope between ST MH-13 and ST MH-14 will be reversed and a revised drawing C-027 will be provided in Addendum #2.
20	<b>House Trap Pit</b> Sheet P-063.00 shows the House Trap Pit Slab to be 6'x6' while Sheet S-610.00 shows it to be 8'x8'. Which is the correct detail?	The House Trap Pit Slab shall be built per the structural details shown on drawing S-610.00. Drawing P-063.00 is revised in Addendum No. 1.
21	<b>Utilities (See Sketch RRC-RFI-008-Q1)</b> 1. There is no 4" SAN (BILGE) shown on C-026 nor C-028; only 8" is shown. Which is correct?	1. The sanitary bilge water line is 8-inches. Drawing C-044 will be revised in Addendum #2.
22	<b>Utilities (See Sketch RRC-RFI-008-Q2)</b> 2. There is no pipe shown here as CONTINUATION on Site Drawing C-027. Which is correct?	2. Continuation of stormwater line will be provided in a revised C-027 to be issued in Addendum #2.
23	<b>Utilities (See Sketch RRC-RFI-008-Q3)</b> 3. This is labeled as 15" ST not 10" as shown here. Which is correct?	3. Civil Drawings (Final Utilities ) will be revised in Addendum #2.
24	<b>Regarding Oil Water Separator on Dwg C-036</b> For the Oil Water Separator, please provide manufacturer, specification, dimensions, volumes, flow characteristics, materials, anchor slab dimensions, thickness of Top Slab, or equal.	Specification section 11311 – Oil Water Separator provides acceptable manufacturers (paragraph 2.01.A), volume of the unit (paragraph 2.02.B), flow characteristics (paragraph 2.02), materials (paragraph 2.02), as well as top slab requirements (paragraphs 1.04.F and 3.01.F of section 11311 and Section 03300 – Cast in Place Concrete). Dimensions are provided on the drawing. Please also see note 2 on the drawing regarding dimensions of the unit.
25	<b>Question: House Trap Pit</b> 1. Sheet S-120.00 note for Pile Tip elevation indicates that Pile Region A has a minimum pipe tip elevation of -50 with an estimated elevation of -118. Similarly, Pile Region B has -60 & -200 for minimum & estimated elevation respectively. This is an enormous gap between minimum & estimated & can alter the price per foot depending on the total length. Please clarify.	1. The minimum tip elevation is the minimum elevation to which the pile tip must be driven to penetrate through the non-bearing and compressible soils, regardless of whether the required ultimate driven capacity has been achieved at a higher elevation. The estimated tip elevation is based on the geotechnical investigation and reflects the tip elevation at which the pile is anticipated to 'fetch up' and achieve the required ultimate driven capacity.

No.	Bidders' Questions	DDC Responses
26	<p><b>Question: House Trap Pit</b></p> <p>2. On Sheet S-610.00, STS 1 &amp; 2, Electrical Manholes are shown to have steel pipe piles. Considering the size of the OWS slab, should it also rest on pipe piles?</p>	<p>2. The geotechnical analysis of the weights of each site structure, as well as the bearing capacity of the soil at each location, resulted in the need for pile supported foundations of the Storm Treatment Systems And Electrical Manholes, but the Oil/Water separator was able to be supported on a prepared subgrade of geotextile-wrapped crushed stone.</p>
27	<p>Please refer to Volume 1 of 3, Bid Booklet, sheet 21-3 of the Contractor's Bid Schedule. In the left-hand column titled "Unit Price" column it states "TOTAL BID ITEMS 1 through 31." Please clarify what Item 31 is for the Bid Schedule.</p>	<p>The Bid Schedule and Bid Form are revised. See Attachment B, Revisions to the Bid Booklet.</p>
28	<p>On drawing R-211.00, sheet 396, the legend calls for 1 drilled shaft to orient each pile, however in this specification there is no mention of drilled shafts, please advise.</p>	<p>Legends on both Dwgs R-211 and R-011 are revised by Addendum #1. See Attachment D, Revisions to Drawings.</p>
29	<p>On Drawing R-215.00, sheet 400, the Partial Foundation Plan At Truck Weighing Scale calls for a 6" diameter drain pipe, while the approach structure section on the same drawing calls for a 4" diameter drain pipe, which size shall be used?</p>	<p>Drawings R-215.00, sheet 400 and R-015, sheet 347 are correct as shown. Pipe diameter at location of Section 1 is 4" diameter and at the outlet the diameter is 6".</p>
30	<p>On Drawing S-100.00, the existing pile plan seems to have been cut off in both directions towards the side of the page. To the right side of page, it seems that 12 pile caps were cut off, with approximately 38 piles in them. To the left side of the page, it seems that the left half of the caps depicted via Section 7 was cut off, but that the octagon should have 48 existing piles, not the 29 depicted. Please confirm.</p>	<p>Existing pile foundations shown are based on available print copies of original design drawings. As-built drawings are not available. Exact number and extent of existing piles to be demolished shall be the responsibility of the Contractor to determine after demolition of the concrete base slab and pile caps.</p>
31	<p>Please provide the existing contract and/or as-built drawings from the prior contract related to the incinerator slab to be demolished (or provide more sections to fully detail the structure to be demolished).</p>	<p>Drawings S-010 and S-011 are the extent of the information available regarding the existing base slab, receiving pit and foundations.</p>

No.	Bidders' Questions	DDC Responses
32	Please refer to Section 2 on Drawing S-132. It seems to indicate that the Centerline of the first structural wall begins 7'-8" from the "B" line. The Substructure Framing Plan (S-106) shows the Centerline of the first structural wall 17'4" away from the "B" line. Further, Section 2 shows 9'8" between walls, S-106 shows 9'4". Please confirm which drawing governs and the final design intent.	The dimensions in plan on Drawing S-106 are correct. In Section 2 on Drawing S-132, the horizontal dimension that reads 7'-8" shall be revised to read 17'-4" and the horizontal dimension that reads 9'-8" shall be revised to read 9'-4".
33	Please advise to the design intent of the new slab over the existing receiving pit. With the existing receiving pit be backfilled the base slab placed on top? If left open, will there be any access to the existing pit from the slab level? From a constructability standpoint, it would seem to make a giant inaccessible void space, which would make removing form work extremely impractical at best and impossible without additional considerations being taken.	At the Contractor's option, the existing receiving pit may be backfilled up to the elevation of the underside of the base slab of the box-beam structure spanning the pit. If that option is taken, a concrete workmat shall be provided to support the bottom mat of reinforcing for the bottom slab of the box-beam structure.
34	Similar to above, please advise to the design intent of the new structure over the existing receiving pit. From a constructability standpoint, it seems to create 14 completely enclosed void spaces (between the base slab and the pier level slab). This would make removing form work from the pier level slab pour extremely impractical at best and impossible without additional considerations being taken. Would setting precast deck panels be a possible alternative?	Formwork design and construction sequence shall consider that the spaces between the top and bottom slab of the box-beam structure will be inaccessible after construction. Requests to substitute pre-cast panels in lieu of the cast-in-place Pier Level slab (the top, compression slab of the box-beam structure spanning the existing pit) will not be entertained.
35	Please refer to Section 2 on Drawing S-131. Does the line showed 3'-2" below the bottom of the slab near Line "H" and 18 inch below bottom of slab near line "G" correspond to top of fill? If so, should the formwork in both of these areas be void form? Similar to above, stripping any slab form work would be impossible without additional considerations being taken.	The horizontal line 3'-2" below the underside of the pier deck south of Column Line H represents the B8 grade beam that spans north-south between the south wall of the box-beam structure and pile cap H/15. This 3'-2" dimension is incorrect and should have been 2'-10" to correspond to the dimensions for a type B8 grade beam as shown in the Grade Beam Schedule on Drawing S-127. The horizontal line 18" below the underside of the box-beam structure top slab represents the underside of the elevated beams that span north-south between the east-west full-depth walls of the box-beam structure. To eliminate the conflict between the Grade Beam Schedule and the 3'-2" dimensions shown

No.	Bidders' Questions	DDC Responses
		<p>in Section 2 on Drawing S-131, the 3'-2" dimension is deleted from Drawing S-131 by Addendum #1. See Attachment D, Revisions to Drawings.</p>
36	<p>Per Drawing S-127 the Top Bar Schedule for Grade Beam #7 is 12 ea - #10 for the top bars (@4" o.c.). In the bar "C1" splice area, maintaining the 3 inch clear on the sides and equal spacing between the C1 barset (2 ea) and the C bars (1 ea) would leave only 3/4" between each bar. This would seem to make the concrete pouring impractical. Even if we stacked the splice bars by hanging one below the stirrup and the placing of the other above instead of placing them in plane on the stirrup, the space would only be 1-3/8". Would it be possible to increase the bar size and reduce the number of bars to allow for adequate space between the rebar to pour concrete? Is there a different design mix which would be allowed to pour in this area? (This also doesn't account for the interference of the slab rebar which is also continuous through the grade beam area.) Similar issues exist throughout the grade beam schedule where 4 inch spacing is called for.</p>	<p>Please refer to TYPICAL GRADE BEAM TOP BAR PLACING PLAN on Drawing S-127 as well as the various grade beam sections on Drawing S-134 which all show the grade beam top reinforcing bars not only falling outside of the grade beam stirrups but beyond the width of the beam itself, extending out into the pier slab. Top bars shall be placed in strict accordance with the spacings given in the GRADE BEAM SCHEDULE on Bid Drawing S-127. It should not therefore be necessary, nor will it be acceptable, to modify the grade beam reinforcing size/quantity or provide a modified concrete mix design.</p>
37	<p>Per Drawing S-127, the grade beam schedule for "B17" calls for a "B" Detail for the top bars. This grade beam does not seem to have a stepped ledge that would require a "B" schedule of bars. Please advise or provide a section to clarify.</p>	<p>The only instance of grade beam type B17 is located at the eastern edge of the Equipment Platform east of Column Line 17. This particular grade beam has a large depression along most, but not all of its length to accommodate the stairway from the parking lot to the Equipment Platform. The bars indicated as B TOP BARS in the GRADE BEAM SCHEDULE on Bid Drawing S-127 are to be placed at the top of the grade beam in the portion that is full-height, while the C TOP BARS are to be placed the full-length of the grade beam at the elevation corresponding to the depressed portion of the grade beam at the stair. See Drawing S-129 for information on the geometry of the Equipment Platform.</p>

No.	Bidders' Questions	DDC Responses
38	Drawing S-131 calls for #6 @ 8" reinforcing (typ) for the top and bottom mat traveling from Line "14" to Line "17". Plan drawing S-111 shows #5 @ 8" reinforcing (typ) in that area. Please advise.	Slab reinforcing shown in plan (Drawings S-111 and S-112) is for the typical Pier Level slab, but not the box-beam structure over the existing receiving pit (hence the absence of reinforcing over the receiving pit in each plan). Section 1 on Drawing S-131 (cut between Column Lines F and G on Drawing S-112) reflects the typical reinforcing for the box-beam structure. The reinforcing for the top slab of the box-beam structure can be found in the sections on Drawings S-131 and S-132. Call-outs of Pier Level slab reinforcement shown on Drawing S-111 are unrelated to Section 1 on Bid Drawing S-131.
39	On Drawings S-103 and S-104, there is a dimensional clash for the pile layouts of Lines "K" and "L" between Lines "10" and "13". The distance between 10 and 13 is 27'. The sum of distances between the piles ( 7'0", 6'5", 5'7", and 7'11" to the column line) adds up to 26'11". We believe the 7'11" should be 8'0". Please confirm which dimension holds.	See Attachment D, Revisions to Drawings for revised dimensions.
40	Is it possible to provide a "to scale" AutoCAD drawing of the existing pile layout? We are trying to analyze how many of the existing piles will need to be cut down for the new concrete.	Existing pile foundations shown are based on available print copies of original design drawings, as as-built drawings are not available. Exact number and extent of existing piles to be demolished shall be the responsibility of the Contractor to determine after demolition of the concrete base slab and pile caps.
41	Regarding the concrete ramp, will a precast option (barrier, superstructure) be accepted by the owner? Using precast will help us in the constructability of the job.	Concrete ramp structure shall be cast-in-place as per contract drawings.
42	Regarding the concrete ramp, please provide the manufacturer details on MSES wall structure.	It is not clear what contractor is asking for here. Please clarify question.
43	Drawing S-610 shows Section 5/ S-610 drawn through the house trap pit with 12 3/4" Steel Pipe Piles. There is no Bid Item for these piles. Please provide.	The House Trap Pit slab detailed on Drawing S-610 shall be supported by the 16" diameter pipe piles detailed on the same drawing. See Attachment D, Revisions to Drawings for clarification of pipe pile dimension. The Bid Item for 16" diameter pipe piles will be applicable to these piles.

No.	Bidders' Questions	DDC Responses
44	<p>Drawings S-120 and S-600 show 20" 150 ton steel pipe pile detail: a) please advise whether these piles require reinforcing steel. a) please advise whether these piles require reinforcing steel. None is shown, if required please provide; b) The pipe pile detail on Drawing S-120 shows estimated pile tip elevation as -118 for Region A and -200 for Region B. Drawing S-600 shows estimated tip elevation as -198.75. Please advise the meaning of these elevations for bidding purposes.</p>	<p>a. The concrete fill of the steel pipe piles shall be unreinforced. \</p> <p>b. The estimated tip elevation is based on the geotechnical investigation and reflects the tip elevation at which the pile is anticipated to 'fetch up' and achieve the required ultimate driven capacity.</p>
45	<p>The lighting fixture schedule specifies that light fixture Type "B1" is 1' x 8' however, the drawings indicate this fixture to be 1'x4' in size. Please clarify the dimensions of this light fixture.</p>	<p>The schedule is correct. B1 is an 8 foot fixture and contains 2-4 foot lamps. That will make it have the same brightness as the B fixtures which are 4 foot and contain 1-4 foot lamp. 8 foot lamps are not acceptable on this project.</p>
46	<p>On the Feeder Schedules on Drawings E-121 and E-122 there are numerous line items labeled as "Not Used" however, these same feeders are indicated on the drawings (for instance 2M11B and 2M29B). Please clarify</p>	<p>The schedule is correct. The E-316 and E-317 drawings will be updated in Addendum #2 to match the Lidding System block diagram on E-112.</p>
47	<p>Can you please advise if it will be acceptable to perform an on-site crushing operation of the concrete removed as part of the demolition of the existing incinerator slab for reuse as structural fill?</p>	<p>The existing slab has not been tested to determine its structural quality, environmental characteristics or any other characteristics that could affect its suitability. Therefore, acceptability of this proposal will not be evaluated or approved prior to bid opening. Although such a proposal may be entertained for approval during shop drawing review, there is no guarantee it would be accepted.</p>
48	<p>There are conflicting guidelines for the demolition of piles. Sheets S-010 and S-011 call for existing pile demolition not to exceed 1'-0" below bottom of new structure. The specification calls for limits of 4'-0" below final finished grade or 2'-0" below bottom of new structure. Please confirm which dimension should govern.</p>	<p>As per section 02222 Article 3.02.A ("... Where no limits are shown or noted, the limits shall be 4 feet below final finished grade or 2 feet below underside of structure, ..."). This requirement applies "where no limits are shown or noted." Therefore, where the drawings show or note a limit, the drawings take precedence.</p>

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT B – REVISIONS TO THE BID BOOKLET**

The Bid Form and Bid Schedule pages of the Bid booklet are revised as follows:

Delete existing BID SCHEDULE PAGES 21, 21-1, 21-2, 21-3, and include attached BID SCHEDULE pages 13-0, 13-1, 13-2, 13-3.

Delete existing BID FORM page 13, and include attached BID FORM page 13-R.

Delete pages 'Certificate of No Change Form' from the Bid Booklet Part B, and replace with the attached pages 'Certificate of No Change Form'. The revised attached forms are 2 pages each, 4 pages total.

**PROJECT ID: S216-399A**

## **BID SCHEDULE**

**Submission:** Bidders are advised that the requirement to submit a Bid Schedule applies to the contract for which an "X" is indicated before the word "Yes". If required, the bidder must submit, with its bid, a completed Bid Schedule. Failure to provide a completed Bid Schedule may result in rejection of the bid as non-responsive.

      X            YES                                      NO

### **Instructions for Preparing Bid Schedule:**

- (A) The following bid prices on the Bid Schedule are to be paid for the actual quantities of the item numbers in the completed work or structure, and they cover the cost of all work, labor, material, tools, plant and appliances of every description necessary to complete the entire work, as specified, and the removal of all debris, temporary work and appliances.
- (B) In preparing its Bid Schedule, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, bonds, and provision of services or items required by the General Conditions [except for Security/Fire Guard Services and Temporary Heat]. If the Project requires Security/Fire Guard Services and/or Temporary Heat, such service(s) will be included as separate line items in the Bid Schedule.
- (C) The Agency may reject a bid if it contains unbalanced bid prices. An unbalanced bid is considered to be one containing lump sum or unit items which do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs, anticipated for the performance of the items in question.
- (D) If an item is not set forth in the Bid Schedule, but is included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to add the item to its Bid Schedule and include the cost of the item in its grand total. In an attachment to its Bid Schedule, the bidder shall provide a list of all items added.

**PLEASE BE SURE A LEGIBLE BID IS ENTERED FOR EACH ITEM.**  
**THE BIDDER SHALL INSERT THE TOTAL BID PRICE ON**  
**THE BID SCHEDULE ON PAGE 13-R OF THIS BID BOOKLET**



Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
1	Structures and Equipment – <i>items a through l</i>				
a.	General Conditions – <i>see DDC General Conditions and the Addendum to the General Conditions</i>	--	Lump Sum	Not Applicable	\$_____
	Temporary Heat	--	Lump Sum	Not Applicable	\$_____
	Security Guards/Fire Guards on Site	--	Lump Sum	Not Applicable	\$_____
	Trailer Office (monthly utility and service costs included)	36	Month(s)	Not Applicable	\$_____
b.	Demolition	--	Lump Sum	Not Applicable	\$_____
c.	Concrete	--	Lump Sum	Not Applicable	\$_____
d.	Masonry	--	Lump Sum	Not Applicable	\$_____
e.	Metals	--	Lump Sum	Not Applicable	\$_____
f.	Woods and Plastics	--	Lump Sum	Not Applicable	\$_____
g.	Thermal and Moisture Protection	--	Lump Sum	Not Applicable	\$_____
h.	Doors and Windows	--	Lump Sum	Not Applicable	\$_____
i.	Finishes	--	Lump Sum	Not Applicable	\$_____
j.	Specialties	--	Lump Sum	Not Applicable	\$_____
k.	Furnishings	--	Lump Sum	Not Applicable	\$_____
l.	Equipment	--	Lump Sum	Not Applicable	\$_____
2	Concrete Ramp – Option 1 OR Mechanically Stabilized Earth Ramp – Option 2	_____ <i>check selection</i> _____	Lump Sum	Not Applicable	\$_____

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
3	Site Work and Landscaping	--	Lump Sum	Not Applicable	\$ _____
4	Gantry Cranes and Container Transport System	--	Lump Sum	Not Applicable	\$ _____
5	3-Year Service Agreement for Container Gantry Cranes	--	Lump Sum	Not Applicable	\$ _____
6	Heating, Ventilation and Air Conditioning	--	Lump Sum	Not Applicable	\$ _____
7	Plumbing and Fire Protection	--	Lump Sum	Not Applicable	\$ _____
8	Electrical Work	--	Lump Sum	Not Applicable	\$ _____
9	NOT USED	--	--	--	--
10	NOT USED	--	--	--	--
11	Hazardous Material Remediation	--	Allowance	Not Applicable	\$75,000
12	Con Edison Electrical Service Work	--	Allowance	Not Applicable	\$150,000
13	Dredging	5,500	CY	\$ _____ per CY	\$ _____
14	Steel Pipe Piles, 16-inch dia.	3,100	LF	\$ _____ per LF	\$ _____
15	Steel Pipe Piles, 20-inch dia. ---OR--- 150-Ton Composite Tapered Piles	103,400 --or-- 669	LF --or-- EA	\$ _____ per LF --or-- \$ _____ each	\$ _____
16	Steel Pipe Piles, 36-inch dia.: For Concrete Ramp – Option 1 ---OR--- For Mechanically Stabilized Earth Ramp – Option 2 <i>Option selection must match ramp option selected in Bid Item 2</i>	5,800 --or-- 4,000	LF	\$ _____ per LF --or-- \$ _____ per LF	\$ _____
17	Pile Driving Analyzer Load Tests - Steel Pipe Piles	50	EA	\$ _____ each	\$ _____

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
18	Compression Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$_____ each	\$_____
19	Compression Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$_____ each	\$_____
20	Lateral Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$_____ each	\$_____
21	Lateral Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$_____ each	\$_____
22	Marine Timber Piles	850	LF	\$_____ per LF	\$_____
23	Concrete Spall Repair - Shallow	100	SF	\$_____ per SF	\$_____
24	Concrete Spall Repair - Deep	100	CF	\$_____ per CF	\$_____
25	Concrete Crack Repair - Type A	500	LF	\$_____ per LF	\$_____
26	Concrete Crack Repair - Type B	200	LF	\$_____ per LF	\$_____
27	Concrete Crack Repair - Type C	100	LF	\$_____ per LF	\$_____
28	Additional Earth Excavation	500	CY	\$_____ per CY	\$_____
29	Additional Select Fill	100	CY	\$_____ per CY	\$_____
30	Additional Common Fill	100	CY	\$_____ per CY	\$_____
				<b>TOTAL BID ITEMS 1 through 30</b>	\$_____

**BID FORM**

---

**PROJECT ID: S216-399A**

**TOTAL BID PRICE:** In the space provided below, the Bidder shall indicate the total bid price in figures.

Total Price for all work                      \$ \_\_\_\_\_

**BIDDER'S SIGNATURE AND AFFIDAVIT**

**WARNING!!** Failure to comply with items below will result in the rejection of your bid.

- \* SUBCONTRACTORS:** You **MUST** complete and submit the form entitled "Bidder's Identification of Subcontractors" (See Page 17) at the time you submit your bid. You must submit this form in a separate, sealed envelope (BID ENVELOPE #2). In the event an award of contract is not made to the Bidder, the Bidder hereby authorizes the Agency to shred the form entitled "Bidder's Identification of Subcontractors". \_\_\_\_\_ Yes  
\_\_\_\_\_ No
- \* MWBE GOALS:** You **MUST** complete and submit the Affirmations contained in the Subcontractor Utilization Plan (See Page 7), or a pre-approved waiver (See Page 9), at the time you submit your bid. You must submit the Affirmations (or a pre-approved waiver) in BID ENVELOPE #1.

Bidder: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of Partner or corporate officer)

Attest:  
(Corporate Seal)

\_\_\_\_\_  
Secretary of Corporate Bidder

Affidavit on the following page should be subscribed  
and sworn to before a Notary Public

# Certificate of No Change Form



- Please submit two completed forms. Copies will not be accepted.
- Please send both copies to the agency that requested it, unless you are advised to send it directly to the Mayor's Office of Contract Services (MOCS).
- A materially false statement willfully or fraudulently made in connection with this certification, and/or the failure to conduct appropriate due diligence in verifying the information that is the subject of this certification, may result in rendering the submitting entity non-responsible for the purpose of contract award.
- A materially false statement willfully or fraudulently made in connection with this certification may subject the person making the false statement to criminal charges

I, \_\_\_\_\_, being duly sworn, state that I have read  
*Enter Your Name*

and understand all the items contained in the vendor questionnaire and any submission of change as identified on page one of this form and certify that as of this date, these items have not changed. I further certify that, to the best of my knowledge, information and belief, those answers are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate.

In addition, I further certify on behalf of the submitting vendor that the information contained in the principal questionnaire(s) and any submission of change identified on page two of this form have not changed and have been verified and continue, to the best of my knowledge, to be full, complete and accurate.

I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

## **Vendor Questionnaire** *This section is required.*

*This refers to the vendor questionnaire(s) submitted for the vendor doing business with the City.*

Name of Submitting Entity: \_\_\_\_\_

Vendor's Address: \_\_\_\_\_

Vendor's EIN or TIN: \_\_\_\_\_ Requesting Agency: \_\_\_\_\_

Are you submitting this Certification as a parent? (Please circle one)      Yes      No

Signature date on the last full vendor questionnaire signed for the submitting vendor: \_\_\_\_\_

Signature date on change submission for the submitting vendor: \_\_\_\_\_

# Principal Questionnaire

*This section refers to the most recent principal questionnaire submissions.*



Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on submission of change
1		
2		
3		
4		
5		
6		

☐ Check if additional changes were submitted and attach a document with the date of additional submissions.

## Certification *This section is required.*

*This form must be signed and notarized. Please complete this twice. Copies will not be accepted.*

**Certified By:**

\_\_\_\_\_  
Name (Print)

\_\_\_\_\_  
Title

\_\_\_\_\_  
Name of Submitting Entity

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Notarized By:**

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
County License Issued

\_\_\_\_\_  
License Number

Sworn to before me on: \_\_\_\_\_  
Date

# Certificate of No Change Form



- Please submit two completed forms. Copies will not be accepted.
- Please send both copies to the agency that requested it, unless you are advised to send it directly to the Mayor's Office of Contract Services (MOCS).
- A materially false statement willfully or fraudulently made in connection with this certification, and/or the failure to conduct appropriate due diligence in verifying the information that is the subject of this certification, may result in rendering the submitting entity non-responsible for the purpose of contract award.
- A materially false statement willfully or fraudulently made in connection with this certification may subject the person making the false statement to criminal charges

I, \_\_\_\_\_, being duly sworn, state that I have read  
*Enter Your Name*

and understand all the items contained in the vendor questionnaire and any submission of change as identified on page one of this form and certify that as of this date, these items have not changed. I further certify that, to the best of my knowledge, information and belief, those answers are full, complete, and accurate; and that, to the best of my knowledge, information, and belief, those answers continue to be full, complete, and accurate.

In addition, I further certify on behalf of the submitting vendor that the information contained in the principal questionnaire(s) and any submission of change identified on page two of this form have not changed and have been verified and continue, to the best of my knowledge, to be full, complete and accurate.

I understand that the City of New York will rely on the information supplied in this certification as additional inducement to enter into a contract with the submitting entity.

## **Vendor Questionnaire** *This section is required.*

*This refers to the vendor questionnaire(s) submitted for the vendor doing business with the City.*

Name of Submitting Entity: \_\_\_\_\_

Vendor's Address: \_\_\_\_\_

Vendor's EIN or TIN: \_\_\_\_\_ Requesting Agency: \_\_\_\_\_

Are you submitting this Certification as a parent? (Please circle one)      Yes      No

Signature date on the last full vendor questionnaire signed for the submitting vendor: \_\_\_\_\_

Signature date on change submission for the submitting vendor: \_\_\_\_\_

# Principal Questionnaire

*This section refers to the most recent principal questionnaire submissions.*



Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on submission of change
1		
2		
3		
4		
5		
6		

☐ Check if additional changes were submitted and attach a document with the date of additional submissions.

## Certification *This section is required.*

*This form must be signed and notarized. Please complete this twice. Copies will not be accepted.*

### Certified By:

\_\_\_\_\_  
*Name (Print)*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Name of Submitting Entity*

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Date*

### Notarized By:

\_\_\_\_\_  
*Notary Public*

\_\_\_\_\_  
*County License Issued*

\_\_\_\_\_  
*License Number*

Sworn to before me on: \_\_\_\_\_  
*Date*



**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT C – REVISIONS TO THE SPECIFICATIONS**

Specification Section 01120 Contract Summary, Page 01120-2

1. Part 1.04A.2: Change the date “December 12, 2003” to read “December 19, 2003.
2. Part 1.04A.3: Change the word “Inspections” to read “Inspection”.
3. Part 1.04A.4: Revise to read as follows:

*“Draft Report on Geotechnical Investigation, Southwest Brooklyn Marine Transfer Station Conversions, New York City Department of Sanitation, April 2005.”*

4. Part 1.04A.6: Revise to read as follows:

*“6. Summary of Sediment Sampling at Department of Sanitation MTS Conversion Program Sites, May 2004.”*

Specification Section 01355 Regulated Materials Control

1. Page 01355-1, Part 1.02A: Delete this part in its entirety.
2. Page 01355-8
  - a. Part 1.09A.5: Revise to read as follows:

*“In addition to the submittal requirements specified in this Part, the Contractor shall comply with the submittal requirements presented in the Information for Bidders Section 41 - DDC Safety Requirements.”*

- b. Part 1.09E: Delete this part in its entirety.

Specification 02224 Removal of Arsenic-Impacted Wood – Environmental Requirements

1. Page 02224-1, Part 1.02B. Delete this part in its entirety.
2. Page 02224-5, Part 3.03A. Revise “Section 01356 – Safe and Healthful Working Conditions” to read “in the Information for Bidders Section 41 – DDC Safety Requirements”.

Specification 02225 Impacted Soil Handling

1. Page 02225-1, Part 1.02B. Delete this part in its entirety.
2. Page 02225-6
  - a. Part 3.06A: Revise “Section 01356 – Safe and Healthful Working Conditions” to read “Information for Bidders Section 41 – DDC Safety Requirements”.
  - b. Part 3.07A: Revise “Section 01356 – safe and Healthful Working Conditions” to read “the Information for Bidders Section 41 – DDC Safety Requirements”.

Section 02240 Dewatering, Page 02240-10

Part 3.05H: Revise "Section 01356 – Safe and Healthful Working Conditions" to read "the Information for Bidders Section 41 – DDC Safety Requirements".

Specification 02291 Air Monitoring Program

1. Page 02291-1

- a. Part 1.02B. Delete this part in its entirety.
- b. Part 1.03A. Revise "Section 01356 – Safe and Healthful Working Conditions" to read "the Information for Bidders Section 41 – DDC Safety Requirements".
- c. Part 3.04A. Revise "Section 01356 – Safe and Healthful Working Conditions" to read "the Information for Bidders Section 41 – DDC Safety Requirements".

Specification 02325 Dredging and Dredged Material Disposal, Page 02325-7

1. Page 02325-1, Part 1.03A: At the end of this paragraph, insert the following: "the cost thereof shall be included in the unit price for dredging."

2. Page 02325-2

- a. Part 1.03E. Revise to read as follows:

"The Contractor shall pay dredged material disposal and debris disposal charges and include them in its corresponding price paid for dredging. The Contractor must submit to the City of New York copies of sworn representations by any third party accepting the dredged material and debris for disposal that (i) it acknowledges that it takes title to the material upon receipt; (ii) it is responsible to ensure that disposal is done in accordance with all applicable law; and (iii) it will hold the City of New York harmless from any liabilities related to disposal of the material. No separate payment will be made for disposal costs."

- b. Part 1.04.A: Revise "Plans" to read "Drawings".
  - c. Part 1.04.B: Revise "2008" to read "1968"
  - d. Part 1.05.B: After "HydroQual, Inc. " insert ", available as described in Section 01120 - Contract Summary."
3. Page 02325-4
- a. Part 1.06.A.4.a: Delete "and post dredge". Delete "and results".
  - b. Part 1.07.A: Revise "City of New York will perform a preconstruction sounding survey of the site to" to read "sound surveys of the site will".
  - c. Part 1.07.B: Delete this part in its entirety.
4. Page 02325-7, Part 1.11.B: Revise "Section 01356 – Safe and Healthful Working Conditions" to read "in the Information for Bidders Section 41 – DDC Safety Requirements".
5. Page 02325-7
- a. Part 3.01.B: Revise "milestone dates" to read "project schedule".

- b. Part 3.01.H: Revise "such findings may be considered as Changed Conditions" to read "the provisions of Chapter VI of the Standard Construction Contract shall apply".
- 6. Page 02325-9, Part 3.02.D: Revise "City" to read "City of New York".
- 7. Page 02325-10
  - a. Part 3.04.A.5: Revise "City of New York" to read "City of New York, Department of Sanitation".
  - b. Part 3.04.B: Revise "all other contractors, the Port Authority of New York & New Jersey, New York City" to read "City of New York". Delete "there is".
- 8. Page 02325-11
  - a. Part 3.05.C: Revise "contract" to read "Contract"
  - b. Part 3.06.A: After "disposal site" insert ", in accordance with Paragraph 3.01.G"
- 9. Page 02325-12
  - a. Part 3.07.A: Revise "as close to" to read "before". Delete "as possible, but not more than 14 calendar days prior to commencement of work".
  - b. Part 3.07.B: Revise to read as follows:
    - "B. The Contractor shall perform a post-dredge survey after completion of the work for each complete dredge area."
  - c. Part 3.07.C: Revise to read as follows:
    - "C. All areas found to be in compliance with the Contract requirements will be measured for payment in accordance with Section 01270 - Measurement and Payment. If the post-dredge survey data indicates that the dredged area is not at the required depth (within the overdredge allowance), the Contractor will be directed to resume dredging to complete the work to project depth and to perform another post-dredge survey."
  - d. Part 3.07.D: Revise "The material removed will be measured by cubic yards in place, by means of the soundings taken before and after dredging. Soundings shall be" to read "The material removed will be measured by cubic yard in place, by means of soundings taken before dredging and after accepted completion of the dredging. Soundings shall be conducted by the Contractor".
  - e. Part 3.07.D: Revise "having his representative" to read "being".
- 10. Page 02325-13, Part 3.10: Revise to read as follows:

**"3.10 FINAL EXAMINATION AND ACCEPTANCE**

- A. As soon as practicable after the completion of the work of this section, a final examination of the work will be conducted by the Commissioner. Should any shoals, lumps, or other lack of contract depth be disclosed by this examination, the Contractor will be required to remove same by mechanical dredge. However, if the

bottom is soft and the shoal areas are small and form no material obstruction to navigation, the removal of such shoal may be waived at the discretion of the Commissioner. The Contractor or its authorized representative will be notified when hydrographic surveying will be performed, and will be permitted to accompany the survey. When the area is found to be at the required depth(s) and slope(s) within the overdredge allowances, it will be accepted finally.

- B. Should more than two sounding operations by the City of New York be necessary over an area because of additional work to remove shoals disclosed by a prior sounding, a charge will be assessed against the Contractor to compensate the City of New York for its actual comprehensive costs caused by the need for additional operations. This charge will be calculated based on the actual costs incurred by the City of New York while engaged in sounding or during which its equipment is enroute to or from the site or held at or near the site for the third and any subsequent sounding operations. After the work of this section has been finally accepted, no additional dredging will be required of the Contractor to remove material which may have deposited in the dredge area."

Specification 02380 Rock Works, Page 02380-1

Part 1.02A: Delete this part in its entirety.

Specification Section 02839 Mechanically Stabilized Earth (MSE) Retaining Walls, Page 02839-8

Part 1.05G. After this part, add the following:

- "H. The details of ground improvement excavation and replacement required to achieve 4ksf within MSE footprint. Or details of alternative ground improvement method. See contract drawings for details.

1.06 MEASUREMENT AND PAYMENT

A. Measurement

1. Payment of MSE walls shall be included under the lump sum Ramp Construction item detailed in Specification 01270, section 1.02B. Where ever MSE walls are utilized, the following items shall be included within the Contractor's lump sum bid amount.
2. All MSE appurtenances shall be included in Ramp Construction price including the items below and the associated ground improvement below wall footprint:
  - a. Separate payment will not be made for foundation excavation, concrete leveling pads, precast wall elements, reinforcing strips, joint materials, fasteners, select specified backfill, Coarse Aggregate, Size No. 57, Porous fill, Filter fabric, Concrete in Barrier Parapets, C.I.P. Moment Slab, Reinforcement Steel, Impervious Membrane, Drainage Pipe, perforated corrugated metal underdrain pipe (PCMP), Temporary Sheet piling to Remain, riprap, Concrete slab in front of the abutments, Concrete coping, waterproofing, and all other appurtenant within the common structure volume, the cost of which shall be included in the cost of the various MSE Abutment Walls.

- b. Separate payment will not be made for earthwork within the common structure volume, the cost of which shall be included in the cost of the various MSE Abutment Walls.
- c. Separate payment will not be made for any bump-out not shown on the contract plans and the cost of which shall be included in the cost of the various MSE Walls.
- d. Separate payment will not be made for temporary sheeting, dewatering, excavation and backfilling required in footprint of MSE walls, or any alternative ground improvement methods, used to improve soil quality under ramps to the required 4 kips per square foot.
- e. Separate payment will not be made for any utility relocation required within the footprint of the MSE wall. Note that any relocations required shall meet the requirements of the associated agency or owner of such utilities."

Specification Section 03350 Concrete Finishes, Page 03350-11

Part 3.02.A.8: Revise to read as follows:

- "8. Type "H" - Heavy Duty Abrasive Shake-on Hardened Finish: Provide broadcast-applied hardener finish by applying a specially graded, non-metallic, natural mineral aggregate concurrently with the application of a floated, Type "C" finish with a minimum FF25 flat finish tolerance in accordance with ACI 117. Apply hardener in strict accordance with the manufacturer's instructions. After the concrete has sufficiently hardened, the final finish is to be completed with a power trowel fitted with float shoes to create a swirled slightly roughened finish where the concrete surface is closed."

Specification Section 03450 Plant-Precast Architectural Concrete, Page 03450-7

Part 2.07.A: Revise to read:

- A. Cellular Plastic Weep/Vent: One piece, flexible extrusion made from UV resistant polypropylene copolymer, 3/8" wide x 3 3/8 inches high x 4 inches long, in color clear. Install at shelf angles or foundation walls at each vertical joint and horizontally 24 inches on center."

Specification Section 07115 Bituminous Dampproofing, Page 07115-1

Part 1.02E: Revise to read as follows:

- "E. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents."

Specification Section 07141 Surface Applied Interior Waterproofing, Page 07141-1

Part 1.02E: After this part, add the following:

- "F. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents."

Specification Section 07410 Metal Wall Panels, Page 07410-9

Part 2.02A.2.a.(2): Revise to read:

- “(2) Color: Custom color matching Pantone Matching System (PMS) Color - Cool Gray No. 2U or approved equal.”

Specification Section 09967 Coating for Steel Waterfront Structures, Page 09967-1

Part 1.02B. Delete this part in its entirety.

Specification Section 13125, Resident Engineer's Field Office Trailer, Page 13125-1

Part 1.04A: Delete the phrase “Article 4 of”.

Specification 13287 Environmental Waste Transportation and Disposition, Page 13287-1

Part 1.02B. Delete this part in its entirety.

Specification Section 14640 Container Gantry Crane

1. Page 14640-12, Part 2.02A.8: After “Part 2” in the second line, delete “Parts,”.
2. Page 14640-15
  - a. Part 2.03B: After “Part 2,” in the first line, delete “Parts,”.
  - b. Part 2.03C: After “Part 2,” in the first line, delete “Parts,” and after “Part 2,” in the fourth line, delete “Parts,”.
  - c. Part 2.03E: After “Part 2,” in the first line, delete “Parts,”.
  - d. Part 2.03F: After “Part 2,” in the first line, delete “Parts,”.
  - e. Part 2.03G: After “Part 2,” in the fifth line, delete “Parts,” and after “Part 2,” in the ninth line, delete “Parts,”.
3. Page 14640-21, Part 2.06C.5:
  - a. Change “Part 1” to “Part 2”.
  - b. Change “Articles 1.03 and 1.04” to “Articles 2.03 and 2.04”.
4. Page 14640-104, Part 3.02A.4: Change “13 and 14” to “1.19, 1.36 and 1.37”.
5. Page 14640-106, Part 3.02E.2.b: Change “Part 1, General, Article 1.04.A” to “Part 2, Products, Article 2.04.A.”

Specification Section 15051 Ductile Iron Pipe, Page 15051-10

Part 3.01B. Delete the phrase “of the Plumbing Contract”.

Specification Section 15081 Piping Insulation

1. Page 15081-1, Part 1.02E: After this part, insert the following:

“F. Section 15120 - Interior and Exposed Piping Schedules”
2. Page 15081-2, Part 1.07: After this part, insert the following:

“1.08 REFERENCES

  - A. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation
  - B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

- C. NFPA 255 - Surface Burning Characteristics of Building Materials
- D. UL 723 - Surface Burning Characteristics of Building Materials"

3. Page 15081-3, Part 2.01A.1.b: After this part, insert the following:

"2. Closed-Cell Insulation

- a. Armacell
- b. Or approved equal

2. Page 15081-3, Part 2.02B: After this part, insert the following:

"C. Close-Cell Insulation: Provide waterproof, closed-cell type with a zero water vapor transmission rate, temperature range of -10 degree F to +200 degree F and which do not contain corrosive constituents associated with stress corrosion failure of copper tube. Provide insulation which has excellent resistance to chemicals, ozone and solvents. Provide seam joining to be moisture proof using non-toxic sealant. Insulation shall have a thermal conductivity 0.25 BTU-in/hr. ft<sup>2</sup>-°F."

3. Page 15081-9, Part 3.08: Revise this part to read as follows:

"3.08 INSULATION APPLICATION SCHEDULE

A. Indoor Mechanical/Process Services: Dust Suppression, Odor Control, Odor Control Drain & Service Water

- 1. Operating Temperature: 60 to 140 deg F
- 2. Insulation Material: Cellular Glass
- 3. Vapor Retarder: Yes
- 4. Jacket: Refer to Schedule in Section 15120 – Interior and Exposed Piping Schedules
- 5. Insulation Thickness: Refer to Schedule in Section 15120 – Interior and Exposed Piping Schedules

B. HVAC Liquid Line Refrigerant Piping

- 1. Operating Temperature: 0 to 39 deg. F
- 2. Insulation Material: Closed-cell
- 3. Vapor Retarder: Yes
- 4. Jacket: none
- 5. Insulation Thickness
  - a. Pipe size - 1 inch and smaller, insulation -1 inch thick
  - b. Pipe size - Over 1 inch, insulation - 1 ½ inch thick

C. HVAC Hot Gas Refrigerant Piping

- 1. Operating Temperature: up to 200 deg. F
- 2. Insulation Material: Closed-cell
- 3. Vapor Retarder: Yes
- 4. Jacket: none

5. Insulation Thickness
  - a. Pipe size - 1 inch and smaller, insulation -1 inch thick
  - b. Pipe size - 1-¼ inch to 2 inch, insulation - 1 ½ inch thick
  - c. Pipe size - Over 2-1/2 inch, insulation - 2 inch thick
- D. Indoor Plumbing Services: Domestic Hot and Recirculated Hot Water, Domestic Cold Water
  1. Operating Temperature: 60 to 140 deg F
  2. Insulation Material: Cellular Glass
  3. Vapor Retarder: Yes
  4. Jacket: Stainless Steel
  5. Insulation Thickness
    - a. Pipe size - ¾ inch to 1 ½ inch, insulation -1 inch thick
    - b. Pipe size - 2 inch to 2 ½ inch, insulation - 1 ½ inch thick
    - c. Pipe size - 3 inch to 4 inch, insulation - 2 inch thick
- E. Indoor Plumbing Services: Sanitary and Storm Drainage
  1. Operating Temperature: 60 to 140 deg F
  2. Insulation Material: Cellular Glass
  3. Vapor Retarder: Yes
  4. Jacket: Stainless Steel
  5. Insulation Thickness
    - a. Pipe size - 2 inch to 2 ½ inch, insulation -1 1/2 inch thick
    - b. Pipe size - 3 inch to 15 inch, insulation - 2 inch thick
- F. Fire Protection Piping, Indoor
  1. Operating Temperature: 60 to 140 deg F
  2. Insulation Material: Cellular glass
  3. Vapor Retarder: Yes
  4. Jacket: Stainless Steel
  5. Insulation Thickness
    - a. Pipe size - ¾ inch to 1 ½ inch, insulation -1 inch thick
    - b. Pipe size - 2 inch to 2 ½ inch, insulation - 1 ½ inch thick
    - c. Pipe size - 3 inch to 4 inch, insulation - 2 inch thick
- G. Fire Protection Piping (Wet Sprinkler, Siamese & Standpipe Systems)
  1. Operating Temperature: -20 to 140 deg F
  2. Insulation Material: Cellular glass
  3. Vapor Retarder: Yes
  4. Jacket: Stainless Steel
  5. Insulation Thickness:
    - a. Pipe size - 1 ½ inch, insulation -1 inch thick



- b. Pipe size - 2 inch to 2 ½ inch, insulation - 1 ½ inch thick
- c. Pipe size - 3 inch to 8 inch, insulation – 2 inch thick”

Specification Section 16751 Access Control System

1. Page 16751-1, Part 1.01B:
  - a. Before the first sentence, add the following:

“Coordination with Other DSNY MTS Contracts:”
  - b. Change “located at other City of New York Transfer Stations” to read “provided under the previous DSNY Contract for construction of the North Shore Marine Transfer Station”.
2. Page 16751-2, Part 1.04C.4: After this part, add the following:

“5. Furnish building floor plan and equipment room layouts showing cable and conduit routing and space allocation of equipment.”
3. Page 16751-3, Part 1.06D: Change “City of New York” to read “DSNY”.
4. Page 16751-5, Part 2.01B: At the end of this paragraph, add “Other manufacturers of equivalent products may be submitted for approval.”
5. Page 16751-16, Part 2.03A: Change “City of New York’s” to read “DSNY’s”.
6. Page 16751-24, Part 3.01A: Change “Resident Engineer” to read “Commissioner”.
7. Page 16751-25
  - a. Part 3.03B: Change “City of New York” to read “DSNY”.
  - b. Part 3.03C: Change both phrases of “City of New York” to read “DSNY”.
  - c. Part 3.04C: Change “City’s” to read Commissioner’s”.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT D – REVISIONS TO THE DRAWINGS**

**REFER TO DRAWING C-013.00**

Replace Drawing C-013.00 with Drawing C-013.01, a copy of which is attached hereto.

**REFER TO DRAWING C-015.00**

Replace Drawing C-015.00 with Drawing C-015.01, a copy of which is attached hereto.

**REFER TO DRAWING C-017.00**

Replace Drawing C-017.00 with Drawing C-017.01, a copy of which is attached hereto.

**REFER TO DRAWING C-018.00**

Replace Drawing C-018.00 with Drawing C-018.01, a copy of which is attached hereto.

**REFER TO DRAWING A-111.00**

1. Delete orphan text and leader reading "FLOOR STRIPING" located between Column Lines 1 and 2 and C and D just above the floor elevation tag.
2. Delete orphan text and leader reading "FLOOR STRIPING", dimension lines, and angle call-out located between Column Lines 16 and 17 and Column Line D and the match line.

**REFER TO DRAWING A-112.00**

1. Reposition tag call-out 125-1 located between Column Lines 15 and 16.8 and F and D to actually point to the door.
2. Delete orphan "CJ" callout located along Column Line 16.8 between column line E and F.
3. Delete orphan "CJ" callout located between Column Lines E and F and 1 and 2.
4. Delete orphan text and leader reading "RAMP ABOVE" located by Column E17.

**REFER TO DRAWING A-113.00**

Replace Drawing A-113.00 with Drawing A-113.01, a copy of which is attached hereto.

**REFER TO DRAWING A-114.00**

Replace Drawing A-114.00 with Drawing A-114.01, a copy of which is attached hereto.

**REFER TO DRAWING A-115.00**

Replace Drawing A-115.00 with Drawing A-115.01, a copy of which is attached hereto.

**REFER TO DRAWING A-117.00**

1. In the Electrical Room #2 Space 310 add a length dimension line to the internal free standing wall to read 17'-6".
2. Add a dimension line to position the wall from the immediate east wall to read 5'-6" and one to position the wall from the immediate north wall to read 3'-10".

**REFER TO DRAWING A-119.00**

Delete parallel phantom lines running east west, and continuous lines running north south over the Electrical Room #2 located between Column Lines C and D and 1 and 2.

**REFER TO DRAWING A-121.00**

Delete railing running north south along column lines 1 and 17.

**REFER TO DRAWING A-141.00**

Replace Drawing A-141.00 with Drawing A-141.01, a copy of which is attached hereto.

**REFER TO DRAWING A-147.00**

Replace Drawing A-147.00 with Drawing A-147.01, a copy of which is attached hereto.

**REFER TO DRAWING A-200.00**

1. Delete siamese connections and call out shown by columns lines 1 and 17.
2. Delete orphan leader by column line 1 at EL 7.50.

**REFER TO DRAWING A-203.00**

Add a siamese connection by column line A at EL 11.50 centered in the first precast panel module. Delete text and leader by column line G reading "INSULATED BLANK-OFF PANELS WITH BIRD-SCREEN".

**REFER TO DRAWING A-221.00**

Delete railing shown at EL. 68.00 Mechanical Mezzanine level.

**REFER TO DRAWING A-223.00**

1. Delete railing shown at EL. 68.00 Mechanical Mezzanine level.
2. Flip to the opposite side the double door next to column line C.
3. Change the 8'-0" suspended ceiling height dimension at the intermediate landing of the stair in vestibule to read 7'-6".

**REFER TO DRAWING A-401.00**

1. Detail D3. Extend concrete wall between stair flights to be 4'-10" from the wall along column line C.
2. Detail D1. Shift right most wall at El. 11.5, between El. 11.5 and El. 28.08, 3'-4 right. Extend suspended ceiling to abut new wall location.

**REFER TO DRAWING A-405.00**

1. Detail C6. Delete orphan text and leader reading "ROOF HATCH PROJECTION" located immediately below detail A6 callout bubble. Point leader arrow from remaining "ROOF HATCH PROJECTION" callout to the square around the top of the ladder.
2. Detail C3. Draw missing stair stringer line.

**REFER TO DRAWING A-500.00**

Add the following notes to this Drawing:

- "11. 2 HR intumescent mastic at vertical lateral bracing where exposed to view typ (UL X625, UL X632).
12. 1½ HR intumescent mastic on beams (UL X625, UL X632) at tipping level in loading bay where indicated."

**REFER TO DRAWING A-900.00**

Replace Drawing A-900.00 with Drawing A-900.01, a copy of which is attached hereto.

**REFER TO DRAWING A-610.00**

Detail A1. Delete black squares and dotted lines around them.

**REFER TO DRAWING S-103.00**

In the dimension string locating the piles along Column Line L, replace the dimension immediately west of Column Line 10 that reads "5'-0"" with "4'-11"" and replace the dimension immediately east of Column Line 10 that reads "7'-0"" with "7'-1"".

**REFER TO DRAWING S-131.00**

In Section 2, delete the vertical dimension at the far left of the section that reads "3'-2"".

**REFER TO DRAWING S-132.00**

In Section 2, replace the two (2) horizontal dimensions at the top of the section and left of Column Line B, the one that reads, "9'-8"" with "9'-4"" and the one that reads "7'-8"" with "17'-4"".

**REFER TO DRAWING S-610.00**

In Section 5, in the call-out of the pile centerline, replace the pile size "12-3/4"" with "16"" and in the dimension string below which identifies the edge distance of the piles to the pile cap, replace both dimensions that read "18"" with "SEE PLAN".

**REFER TO DRAWING R-011.00**

In the LEGEND, revise "DRILLED SHAFT NO. 1 FOR ORIENTATION OF PILE CAP" to read "PIPE PILE NO. 1 FOR ORIENTATION OF PILE CAP".

**REFER TO DRAWING R-102.00**

Replace Drawing R-102.00 with Drawing R-102.01, a copy of which is attached hereto.

**REFER TO DRAWING R-211.00**

In the LEGEND, revise "DRILLED SHAFT NO. 1 FOR ORIENTATION OF PILE CAP" to read "PIPE PILE NO. 1 FOR ORIENTATION OF PILE CAP".

**REFER TO DRAWING R-215.00**

Near the bottom center of the drawing, revise the section title "APPROACH STRUCTURE SECTION 1/R-015" to read "APPROACH STRUCTURE SECTION 1/R-215".

**REFER TO DRAWING R-302.00**

Replace Drawing R-302.00 with Drawing R-302.01, a copy of which is attached hereto.

**REFER TO DRAWING M-114.00**

1. Near the upper right corner, add a label pointing to the break at the end of the 4" CW CL EL 21.50, with text for the label reading 'SEE PLUMBING DRAWINGS FOR CONTINUATION'.
2. Near the upper right corner, locate the 4" CW at CL EL 21.50. Follow the 4" CW horizontally to the left until the pipe turns 90 degrees at the 4" CW CL EL 23.50. At this 90-degree bend, insert an elbow down from EL 23.50 to EL. 21.50 so that the plan matches Section 7 on Drawing M-216.

**REFER TO DRAWING M-121.00**

1. Delete the following five outside pipes that are shown to the right of Column Line 17:
  - a. 4" PD
  - b. 4" CW
  - c. 6" SIA
  - d. (2) 6" FPW
2. Delete the dashed outline enclosing the five pipes described above. Also delete the text 'UNDER RAMP (SEE NOTE 2 & 4)' that appears below these pipes.
3. Delete the ten heat trace triangle symbols associated with the deleted pipes.
4. Delete the text in Note 2 and replace with "NOTE 2 NOT USED".
5. Delete Note 4.

**REFER TO DRAWING M-124.00**

Replace Drawing M-124.00 with Drawing M-124.01, a copy of which is attached hereto.

**REFER TO DRAWING M-216.00**

Replace Drawing M-216.00 with Drawing M-216.01, a copy of which is attached hereto.

**REFER TO DRAWING M-310.00**

1. At the lower left corner, change the dashed line on the 1" CW to a solid, heavy line and change the label to read "4 CW".
2. At the lower left corner, add a leader pointing to the break at the end of the 4" CW with the leader text indicating "SEE DRAWING M-311 FOR CONTINUATION".
3. At the lower left corner, change the gate valve (light line weight) to a reducer (heavy line weight).
4. To the right of the new reducer, add a leader with text "1" CW".
5. At the lower left corner, delete the limit of work symbol and the associated text "P" and "G".
6. On the 1" CW branch feeding the odor control equipment, add a gate valve. Locate the gate valve to the left of the dashed outline for the skid-mounted odor control equipment.
7. At the left side, add a gate valve on the vertical 1" CW. Locate the gate valve between the odor control skid and the dust suppression skid.

**REFER TO DRAWING M-311.00**

1. At the left side, add a leader pointing to the break at the end of the 4" CITY WATER with leader text reading "SEE PLUMBING DRAWINGS FOR CONTINUATION."
2. At the left side, add a vertical branch to the 4" CITY WATER. Locate the branch between the gate valve and the dashed outline for the skid-mounted service water system. Draw the branch vertically down to near the bottom of the page. Place a break symbol at the end of the branch and add a leader pointing to this end with text reading "SEE DRAWING M-310 FOR CONTINUATION."

**REFER TO DRAWING M-312.00**

1. Delete Circuits 13-22 in Heat Tracing System No. 1 F-HTS-01 Block Diagram.
2. Delete Note 3.

**REFER TO DRAWING P-014.00**

At the upper right corner of the Odor Control Room near door, delete the leader "1" PUGGED VALVE FOR ODOR CONTROL WATER SERVICE" along with the associated valve and 1" pipe branch

**REFER TO DRAWING P-020.00**

Replace Drawing P-020.00 with Drawing P-020.01, a copy of which is attached hereto.

**REFER TO DRAWING P-063.00**

Replace Drawing P-063.00 with Drawing P-063.01, a copy of which is attached hereto.

**REFER TO DRAWING P-080.00**

In the "INTERIOR AND EXPOSED PIPING SCHEDULE" revise the following:

1. Delete "INSULATION THICKNESS" column.
2. Delete "JACKET MATERIAL" column.
3. In the "REMARKS" column, delete "SEE NOTE 5" from row titled "SANITARY WASTE UNDERGROUND".
4. In the "REMARKS" column, delete "SEE NOTE 5" from row titled "STORM DRAINAGE PIPING UNDERGROUND".

**DDC PROJECT #:** S216-399A

**PROJECT NAME:** SOUTHWEST BROOKLYN MARINE TRANSFER STATION

**ATTACHMENT E – REVISIONS TO THE ADDENDUM TO THE GENERAL CONDITIONS**

Delete Schedule A page 8 of the Addendum to the General Conditions and replace with Schedule A page 8-R, Rev. Addendum #1, included with this Addendum.

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**  
**Contract Requirements**

Various Articles of the Contract refer to requirements which are set forth in Schedule A of the General Conditions. The Schedule set forth below specifies the following: (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to the contract.

REFERENCE	ITEM	CONTRACT FOR GENERAL CONSTRUCTION			
Article 14 Contract	Time of Completion	Consecutive Calendar Days	Milestone 1 – 730 ccd Milestone 2 – 1,095 ccd		
Article 15 Contract	Liquidated Damages	For each consecutive calendar day over completion time	\$	Milestone 1 – \$5,000/day Milestone 2 - \$5,000/day	
Article 17 Contract	Sub- contracts	Not to exceed percent of Contract Price	80%		
Article 21 Contract	Retainage	Percent of voucher	If 100% bonds are required	5%	
			If 100% bonds are not required, and Contract Price is less than \$500,000	10%	
			If 100% bonds are not required, and Contract Price is more than \$500,000	10%	
Article 24 Contract	Maintenance & Guaranty	Percent of Contract Price	1%		
Article 77 Contract	MWBE Program	See Subcontractor Utilization Plan in the Bid Booklet			





# ADDENDA CONTROL SHEET

**TITLE: Southwest Brooklyn Marine Transfer Station – Building Construction**

**GENERAL  
COUNSEL**

DATE \_\_\_\_\_

[illegible]

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

September 26, 2012

**ADDENDUM No. # 2**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for October 11, 2012, at 2:00 pm is rescheduled to October 25, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to the Addendum to the General Conditions:**

See Attachment B

4. **Revisions to Specifications:**

See Attachment C.

5. **Revisions to Drawings:**

See Attachment D.

6. **Revisions to the Bid Booklet:**

See Attachment E.

7. **Revisions to Volume 2:**

See Attachment F.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
\_\_\_\_\_  
David Resnick, R.A.  
Deputy Commissioner

\_\_\_\_\_  
Name of Bidder

By: \_\_\_\_\_

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT A – BIDDERS QUESTIONS AND DDC RESPONSES**

No.	Bidders' Questions	DDC Responses
1	Can you please advise if the fenced in parking area east of the building site which currently houses impounded vehicles will be available to the General Contractor for a site staging area?	The fenced in parking area east of the building will not be available for site storage and staging. Revised Drawing C013 provided in Addendum #2 shows the space available for site storage and staging. See Attachment D, Revisions to Drawings.
2	Will the area of land along the existing marina south retaining wall be accessible for construction equipment (crane, excavator, loader) and material deliveries (armor stone)?	The marina's retaining wall is adjacent to the DSNY property line. There is no strip of land on the DSNY side of the property line – this area is under water.
3	What is the depth (tip elevation) of the existing fender piles on the North bulkhead?	Available design drawings for the existing fendering indicate the pile tips to be at Elevation - 45'. The as-built condition may differ.
4	Do the new PSP900 King piles have to be coated on the interior, meaning can be coated after assembled as doubles? Or do they have to be coated as singles so all surfaces of the pile are covered?	The interior king pile cavity need not be coated. Each double king pile should be coated externally as a unit after fabrication. An addendum will specify casting a 2 foot deep concrete plug on top of each double king pile cavity after driving, cut-off and coating touch-up, to seal the cavity.
5	On Drawing S-803. 00, how is the contractor expected to install the concrete encasement around the 18 inch diameter RCP in between the bulkhead and cofferdam space of 2'-8" which is partially below mean low water?	Addendum #2 shows demolition of the existing corner segment of concrete walkway. See Attachment D, Revisions to Drawings. This will allow access for excavation of fill between the PZ bulkhead and cofferdam cells before positioning the RCP outfall. As shown in Section 3 on drawing S-803.00, the space between the cofferdam and bulkhead is much wider than 2'-8" on the east side, due to the curvature of the cofferdam's corner cell. Concrete can be placed underwater in conformance with paragraph 3.05.G of Section 03300, cast on screeded excavated subgrade with side forms. Backfill would then be placed to refill between the cell and the bulkhead, and the corner segment of walkway would then be rebuilt to match existing.
6	What are the dimensions and thickness of the steel plate in Section 1/S-904?	The steel plate shown in the referenced section is the flange of the HP12 fender pile.
7	What diameter and wall thickness is the "3X strong" pipe on Detail 2/S-903?	The intended call out is for a 3 inch diameter extra strong (meaning Schedule 80) pipe.
8	What thickness are the corner gussets on Detail 2/S-903?	As indicated in Detail 2, gussets are typically 3/8" thick.

No.	Bidders' Questions	DDC Responses
9	Are the 3/4" diameter x 4" long and 8" long studs for the PZ35 sheet piles shown on Drawing S-801 bare/black uncoated steel?	Yes.
10	Are there any as-builds / details / drawings of the existing marina seawall adjacent to the new King Pile combination wall available for review? Is bracing of this wall mandatory during pile driving?	We are not aware of any as-built drawing for the marina seawall. Bracing is not mandatory, but may be proposed by the contractor as part of his means and methods to avoid exceeding wall movement limits specified in the monitoring program.
11	What spec is to be followed for the ladder shown on Drawing S-804?	Section 05500 for the steel work; Section 09967 for the coating.
12	Can /will the bid date of September 27th be extended?	The Bid Opening date is revised to October 25, 2012 in Addendum #2.
13	Question: Water main tap 1. Are these "Wet Taps"? 10" branch cannot tap off an 8" of main. We can offer an 8x8 wet tap with 8" tapping valve and then use an increaser 8"x10" to connect the 10" FP. Is this acceptable?	The connection of the 10" branch to the 8" main should be done on the junction box shown on Drawing C-028.
14	<p>Question: Final Utilities 3 (Refer to Bidder's Sketch RRC-RFI-004)</p> <p>1. Sketch RRC-RFI-004 says "EXPOSED". Does it apply to exterior, buried piping?</p> <p>2. Sketch RRC-RFI-004 says "City Water 4" Copper". If this applies for exterior buried piping then please permit us to say that It is unusual for domestic water services as large as 4" to be copper; they are usually ductile iron. Please confirm copper.</p> <p>3. Sketch RRC-RFI-004 says Sanitary Sewer 4"-8" shall be ductile iron. There is a quantity of 10" and 12" Sanitary Sewer. May we assume that to be ductile iron with RPOJ (and Restrained Mechanical Joint Fittings) as well?</p>	<p>These questions refer to the schedule located at the end of Section 15120 Interior and Exposed Piping.</p> <p>1. For the schedule in Section 15120, "EXPOSED" applies to exposed interior and exposed exterior piping. The schedule in 15120 does not apply to buried piping. The schedule for buried piping shown on the Civil Final Utilities drawings can be found in Section 02503 Installation of Buried Pipelines. Underground piping shown on Plumbing Drawings shall use the schedule indicated on the plumbing drawings.</p> <p>2. The schedule in 15120 does not apply to buried City Water pipe. See Section 02503 for buried piping schedule.</p> <p>3. The schedule for buried piping shown on the Civil Final Utilities drawings can be found in Section 02503 Installation of Buried Pipelines. Underground piping shown on Plumbing Drawings shall use the schedule indicated on the plumbing drawings.</p>

No.	Bidders' Questions	DDC Responses
	<p>4. Sketch RRC-RFI-004 says Soldered joints. If indeed this is for exterior, buried piping, it is extremely unusual for soldered joints to be used underground. Please advise.</p> <p>5. Sketch RRC-RFI-004 says "Restrained Push On Joints". We assume it also applies as "Restrained Mechanical Joints" where fittings are required. Please confirm.</p> <p>6. Sketch RRC-RFI-004 says "Restrained Push On Joints". We assume it also applies as "Restrained Mechanical Joints" where fittings are required. Please confirm.</p>	<p>4. The schedule in 15120 does not apply to buried piping. The schedule for buried piping shown on the Civil Final Utilities drawings can be found in Section 02503 Installation of Buried Pipelines. Underground piping shown on Plumbing Drawings shall use the schedule indicated on the plumbing drawings.</p> <p>5. Correct</p> <p>6. Correct</p>
15	<p>(Refer to Sketch RRC-RFI-006-Q-4-5) Question 5: Is this electrical conduit sloping for drainage?</p>	<p>Drawing C-027 is revised in Addendum #2. Per Note 4 on Drawing C- 030, lighting duct banks are not required to be sloped. Minimum slope for other duct banks is described in Note 4 on Drawing C-030. Note 4 on Drawing C-030 is clarified in Addendum #2. A revised electrical manhole schedule is provided in Addendum #2. See Attachment D, Revisions to Drawings. Also see Note 3 on Drawing C-048.</p>
16	<p>Spec. Section 01561. Can you please advise if the supply of security guards for the project will be required? The supplemental General Conditions refer one to Specification Section 01561 - Site Security; however, Section 01561 refers one back to the General Conditions.</p>	<p>Section 01561 does not replace the requirements of the General Conditions. The intent is that Section 01561 supplements the requirements of General Conditions Article 1.26. See Attachment B, Revisions to the Addendum to the General and Attachment C, Revisions to Specifications.</p>
17	<p>On C-030.00, the Storm Manhole Schedule does not correspond to the Final Utilities drawings (Sheets C-25 to C-29) in CL coordinates or corresponding branches and invert elevations. For example, ST-MH-8 is shown on drawings C-028.00 after roughly Northing 153,670.00 and Easting 985,008.00 with piping running from from STS-1 (Invert: 0.5 per C-032.00) and out to an 18" Outfall at the bulkhead (Invert: -3.42 per C-032.00). On the schedule, ST MH-8 is located at Northing 154,052.84 and Easting 984,727.43 with branches from STS-1 (Invert: 1.73) and RFD-4 (Invert: 1.38). Similar errors occur throughout the ST MH Schedule. Please</p>	<p>Both the drawings and the manhole schedule have been updated. Revised drawings C-025 through C-030 are provided in Addendum #2. See Attachment D, Revisions to Drawings.</p>

No.	Bidders' Questions	DDC Responses
	update either the drawings or the schedule so that the items match.	
18	The CL Coordinates of the "Electrical and Telephone Manhole Schedule" do not seem to correspond to their locations on the drawings (comparing C-030.00 and C-028.00). Please advise.	The E/W coordinate grid on the civil drawings is incorrect. The coordinate grid is revised in Addendum #2. See Attachment D, Revisions to Drawings.
19	Please provide the details for the existing manholes to be demolished (diameter, depth, etc.).	All available details on the existing manholes are provided on the contract drawings.
20	Please provide the depths of all existing utilities to be demolished.	All available details on the existing utilities are provided on the contract drawings.
21	The CL coordinates of the "Catch Basin Schedule" on Drawing C-030. 00 do not seem to correspond to their locations on the drawings (C-028.00, et al.). Please advise.	The E/W coordinate grid on the civil drawings is incorrect. The coordinate grid is revised in Addendum #2. See Attachment D, Revisions to Drawings.
22	Please provide details for the "Proposed 10 Ft Chain-Link Fence" shown on C-016 and the "12 ft Chain Link Fence" shown on C-018.	Drawings C-016 and C-018 are revised in Attachment D of Addendum #2. References to the fence height have been corrected to read "8'".
23	The location of the building per coordinates provided on Drawing S-100 and the Site Survey Property Lines provided on Drawing A-008 do not match the survey grid provided on the utilities drawings (Drawings C-025 through C-29). Please confirm which drawings should govern.	The E/W coordinate grid on the civil drawings is incorrect. The coordinate grid is revised in Addendum #2. See Attachment D, Revisions to Drawings.
24	Drawing C-030, Electrical Schedules refer to Dwg No C-045 for details. Drawing C-045 does not provide manhole details. Please provide.	A revised Drawing C-030 is provided in Addendum #2. See Attachment D, Revisions to Drawings.
25	The Bid Schedule for pricing the work is very disjointed. Where would you like us to price the cost of for Division 13 and the balance of Divisions 14 and 15?	See Attachment C for revised section 01270 Measurement and Payment, and Attachment E for revised Bid Schedule and revised Contractor's Bid Schedule.
26	To properly bid a project of this magnitude, a thorough review of the plans and quantity take-offs are required. This process generates necessary RFIs and Clarifications to the owner. Adequate time to generate and get their questions answered mitigates ambiguity and affords the best possible price and project for the owner. Unfortunately, adequate time has not been afforded here. In addition, there are other large-scale projects competing with your bid date. In light of the above we request an additional five weeks to properly prepare your bid.	The Bid Opening date is revised to October 25, 2012 in Addendum #2.

No.	Bidders' Questions	DDC Responses
27	(Refer to Sketch RRC-RFI-012A) 1. This says "18" ST OUTFALL ON CONC CRADLE AND PILE SUPORTED" 2. Does the "PILE SUPPORT" extend this length along the 18 inch ST?	1. Drawing C-023 is revised in Addendum 2. The note should read "18" ST OUTFALL ON CONC CRADLE". 2. Revised Drawing C-032 is provided in Addendum #2. See Attachment D, Revisions to Drawings.
28	(Refer to Sketch RRC-RFI-012B) 3. Sketch RRC-RFI-012B does not show any pile support. Is there a reason it is not shown? 4. This does not show any pile support. Is there any pile support along here?	3. Revised Drawing C-032 is provided in Addendum 2. See Attachment D, Revisions to Drawings. 4. Revised Drawing C-032 is provided in Addendum 2. See Attachment D, Revisions to Drawings.
29	(Refer to Drawing C-042, Upper right corner) This detail is entitled "CONC CRADLE ON PILES DETAIL". Yet it does not show any piles support. Is there a reason it is not shown?	This detail is deleted in Addendum #2. Drawing C-042 is revised in Addendum #2. See Attachment D, Revisions to Drawings.
30	(Refer to Sketch RRC-RFI-012C) 6. Does this "CONC CRADLE" extend all the way to the STS 1? If not, where does it stop?	Revised drawings C-032 and C-033 are provided in Addendum 2. See Attachment D, Revisions to Drawings.
31	(Refer to Sketch RRC-RFI-012D) 7. Please provide further details on the dimensions of RRC-RFI-012D "CONC ENCASEMENT" 8. What is this? 9. To what does this dimension of "3" MIN" refer?	Revised Drawing C-032 is provided in Addendum 2. See Attachment D, Revisions to Drawings.
32	(Refer to Sketch RRC-RFI-013A) 1. Sketch RRC-RFI-013A is a 15" ST and 2. Sketch RRC-RFI-013A is a 10" ST that connects to it and 3. Sketch RRC-RFI-013A is a 10" ST that connects to it.  (Refer to Sketch RRC-RFI-013B) 4. Sketch RRC-RFI-013B says that Storm and Sanitary 12" to 30" shall be RCP Class V, so the 15" ST is RCP Class V 5. Sketch RRC-RFI-013B also says that Storm And Sanitary 6" to 10" shall be DI Class 56. Please provide details how to connect 10" DI to 15" RCP.	The piping schedule found in Section 02503 does not apply to storm piping shown on the P drawing series. Storm Piping shown on the P drawings shall comply with the piping schedule shown on P-080 and to specification Section 15160. (Note, however, that Specification Section 15160 does not apply to piping shown on the C drawing series.)  The piping schedule found in Section 02503 applies to the C drawing series.
33	Sheets R-051 and R-251 indicate both asphalt pavement and concrete deck with micro silica wearing surface at the MSE section of proposed ramp. Which is correct? Heavy duty or light duty pavement? Concrete deck thickness? Please clarify.	For Drawing R-051, asphalt pavement (heavy duty) is to be installed from station 10+65 to station 11+90, which is along the M.S.E.S wall limits minus the approaches. Concrete deck slab with micro silica wearing surface shall be installed at locations as called for in the drawing.



No.	Bidders' Questions	DDC Responses
		<p>For Drawing R-251, asphalt pavement (heavy duty) is to be installed from station 10+65 to 10 feet before the end of the M.S.E.S wall shown on drawing R-252. <b>The "CONCRETE DECK SLAB WITH MICRO SILICA WEARING SURFACE" callout located to the left of the matchline A-A on drawing R-251 will be deleted.</b> Change is reflected in Addendum 2 (see Attachment D, Revisions to Drawings). Concrete deck slab with micro silica wearing surface shall be installed at the truck scale as called out in the drawing R-251.</p> <p><b>In addition, for Drawing R-252, the precast barrier unit will terminate before the approach slab.</b> This is corrected in Addendum 2. See Attachment D, Revisions to Drawings.</p> <p>For all concrete deck thicknesses refer to the contract drawings.</p>
34	<p>Contractors Bid Schedule does not include the following:</p> <ol style="list-style-type: none"> <li>1. Marine Fendering</li> <li>2. Building Excavation</li> <li>3. New Steel Bulkhead</li> <li>4. Division 13-Special Construction</li> <li>5. Division 14-Conveying Systems</li> </ol>	<p>See Attachment C for revised section 01270 Measurement and Payment, and Attachment E for revised Bid Schedule and revised Contractor's Bid Schedule.</p>
35	<p>On drawing C-001, guidelines for removal of existing foundation piles are to extract any that interfere with new pile locations and cut 3' below final grade or building base slab elevation if they don't interfere. Spec 02316-5 calls for piles to be cut 18 inches below bottom new footings.</p>	<p>Requirements for removal of existing foundation piles are clarified in Addendum # 2 by revisions to Section 02316 and Drawing C-001. See Attachment C, Revisions to Specifications and Attachment D, Revisions to Drawings.</p>
36	<p>Drawing C-042 provides a section called "CONC CRADLE ON PILES DETAIL". It does not show or describe the piles, and we cannot find other references to piles underneath utilities in the bid documents. Please confirm if piles are required underneath any of the new utilities required for the contract.</p>	<p>Drawing is revised per Addendum 2. See Attachment D, Revisions to Drawings.</p>
37	<p>If possible, please provide estimated quantity (LF) of demolition of the following items located underneath the existing incinerator</p> <p>slab and referenced on Drawing C-001, Note 5: HVAC, Plumbing, Electrical, Piping,</p>	<p>The Contract Drawings already show the extent of the information available regarding these existing items.</p>

No.	Bidders' Questions	DDC Responses
	Valves, ductwork, Conduit, etc.	
38	The slab form work for stair "B" at Pier Level (on the exterior of the building) cannot be stripped after the pour. Please advise if backfilling to underside of slab is a feasible alternative, or if forms should be buried under pour. If forms buried, please specify void forms or regular soffit form work.	The exterior landings and access stair outboard of Column Line 17 and between Column Lines C and D may be constructed by backfilling the void to the underside of the reinforced concrete slabs.
39	On Drawing S-138, the stair slab shown at 7.00 does not show a concrete workmat or grade elevation on the drawing. Please confirm if this slab should be poured slab-on-grade with a 3" concrete workmat underneath it.	Confirmed. For this interior stair, a 3" concrete workmat shall be utilized beneath the lower stair slab at elevation 7.00 similar to the typical Pier Level slab at elevation 11.50.
40	On Drawing S-138, only one direction of the rebar mat for the slab at elevation 7.00 is specified (#6 @ 8"). Should the rebar in the other direction match the dowels called out (#7 @ 8"). Please confirm.	The call-out that reads "#6@8 T&B" shall apply to the reinforcing steel in both directions of both the top and the bottom reinforcing mats.
41	Drawing S-129 does not show a concrete workmat or grade elevation on the drawing. Please confirm if the slab should be poured slab-on-grade with a 3" concrete workmat underneath it.	The exterior landings and access stair outboard of the exterior Pier Level equipment platform may be constructed by backfilling the void to the underside of the reinforced concrete slabs.
42	Note on Drawing S-112 reads "9" x 1'-6" POCKET (6 THUS) SEE DWG S-126". Eight carriage rails are shown. Please confirm the correct quantity.	The note is revised by Addendum #2 to correctly identify the presence of eight (8) carriage rail pockets. See Attachment D, Revisions to Drawings.
43	Please refer to Drawing S-105. At the pilecaps along Lines "J" through "M", it seems the construction joints from the Pier Level Slab have been carried through to the caps. For the joint 6'-9 1/2" to the left of Line "4", it seems the joint would interfere with the pile layout in that area for Lines "J" and "M". Should the joint be moved over to accommodate the pile, and then also moved over at the slab level, or should the pile be shifted? Is there a minimum desired distance between center of pile and a construction joint?	It is acknowledged that the construction joint in the pile caps along Column Lines J and M fall on a proposed location for a new building pile. Due to embedded crane hardware above, this was found to be the most appropriate location for the construction joint through the pier structure. Since the pile cap reinforcement is continuous through the construction joint, the structural capacity is adequate to support the expected loads and the pile bearing will not be affected.
44	On Drawing C-030, Note 6 of "General Utility Notes", please clarify. We cannot envision any condition where the 18" vertical clearance (assumed when pipes cross) would not already be covered under the 10' horizontal clearance.	Note 6 on Dwg C-030 is revised by Addendum #2. See Attachment D, Revisions to Drawings.
45	On Drawing C-035, the coordinates provided for Stormwater Treatment System 2 don't	Coordinates are revised by Addendum #2. See Attachment D, Revisions to Drawings.

No.	Bidders' Questions	DDC Responses
	match up with its location on Drawings C-025 and C-027. They also don't match the orientation or the system, as the opposite corners have the same E/W coordinate. They are only 13'-4 9/16" apart, when they should be 17'-6", assuming 6" walls.	
46	On Drawing C-036, the coordinates provided for the Oil Water Separator don't match up with its location on Drawings C-025 and C-027. Also, the distance between the points is 16'-0 1/4" while the distance between corners of the slab is 17'-3 1/4".	Coordinates are revised by Addendum #2. See Attachment D, Revisions to Drawings.
47	On Drawing S-002, Detail #10 is for "Expansion Joint Detail at Walls and Slabs". There do not seem to be any expansion joints called out on the drawings, specifically within the substructure elements (pilecaps, grade beams, pier level slab, stairs, etc.). Is there any limit dimensionally to concrete beams, walls, or slabs before an expansion joint is required, or are we strictly following joints called out on the drawings?	All joints in reinforced concrete elements shall be placed as shown on the Contract Drawings or as dictated by the Contract Specifications. The standard structural detail of an expansion joint is included in the Contract Drawings to provide direction to the Contractor should a situation arise during construction which may necessitate the introduction of an expansion joint into a reinforced concrete element.
48	With regards to Specification 15810, Section 2.02 C states that "Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (-6 inch W.G.) as shown in the latest edition of the Round Industrial Duct Standards, Chapter 11, Tables 11-5.1 minimum required gage based on bending loads and Table 11-5.1 minimum required gage for Class 5 Stainless Steel Spiral Pipe". Specification 15810 - Section 2.02 D states that "All fittings ends shall come factory equipped with a double lipped, U-profile EPDM rubber gasket." The double lipped, U-profile EPDM rubber gasket is not suitable for use in spiral duct built to the specified pressure class. Please provide an alternate construction standard or the name of a manufacturer who can provide the specified spiral duct construction.	There are at least two options to meet the specification requirements. They are as follows: 1. The SPIRAL HELIX SHG "self-sealing" dual wall gasket can be manufactured with the rolled edges. Delta Sheet Metal Corp. in Long Island City, NY is one of many potential manufacturers. They can be contacted at (718) 429 - 5805. 2. NORDFAB Ducting can manufacture the gasketed connection for spiral stainless steel ductwork. Either Application Associates (732 - 627 - 9400) or Bisco Enterprise (630 - 628 - 2454) can be contacted to help with this application. All of the connections come factory equipped with a double lipped U-profile EPDM rubber gasket suitable for the specified pressure class. The spiral ductwork gauge can be modified (with the engineer's approval) to meet the gasketed connection manufacturer's recommendations.
49	On Drawing S-011, the drawings call for 8" diameter pipes to be installed at eight feet on center in the existing receiving pit. What is the design intent of these pipes? Are they to remain strictly throughout the demolition and then removed, or are they to be permanent, reburied in backfill with the receiving pit slab (Elev. 2.00 through 3.50) placed on top of	The 8" diameter steel pipes are intended to brace the vertical walls of the existing receiving pit that become unsupported once the existing base slab is demolished. (The uncontrolled fill currently in the receiving pit is not assumed to offer any passive resistance against the structural backfill assumed to be present outside of the pit.) The pipe struts are permanent and shall be left in place when the

No.	Bidders' Questions	DDC Responses
	them?	upper portion of the receiving pit is backfilled prior to construction of the box-beam structure to span the Pier Level slab over the pit.
50	Addendum to the General Conditions, Item V, "Applicability of Articles and Amended Articles" states a number of the articles in the General Conditions as "Applies as amended". We understand that to mean the existing General Conditions for the Contract have had those Articles already amended and should be followed as written. Please confirm. Likewise if the articles "Does Not Apply", it can be struck from the existing General Conditions. Please confirm.	See page 4 of the <i>Addendum to the General Conditions</i> for a description of amended articles. Articles listed as "Does Not Apply" are deleted from the existing General Conditions.
51	On Drawing S-610, what is the depth of the anchor slab, 24" (as per Section 3) or 18" (as per Section 1)?	The depth of the oil/water separator anchor slab shall be 18" as shown in Section 1 on Contract Drawing S-610.00. The erroneous dimension on Section 3 of the same drawing is removed by Addendum #2. See Attachment D, Revisions to Drawings.
52	Referring to Drawing S-610, the specifications call out select fill backfill while the plans call out pea gravel backfill for the oil-water separator. Please confirm which type is required.	Pea Gravel shall be placed between the Oil Water Separator and the concrete slab as shown on Drawing S-610.
53	In reference to Section 02317, "Backfilling". Right now the specification calls out the products Select Fill and Common Fill. Common Fill is further divided into Granular Materials and Cohesive Materials. It is not clear where these materials are required. In the MSE overcut you call out Structural Backfill. Is that Select Fill or Granular Material? Please provide a specification for Structural Backfill.	Specification Section 02317 states in <u>Part 3.06 STRUCTURE BACKFILL, Paragraph B. Use of Select Fill</u> : "Use select fill underneath all structures ...". Therefore where STRUCTURAL BACKFILL is called out on the plans use Select Fill.
54	What Structural Backfill specification do you require for the "MSE" walls?	Specification Section 02317 states in <u>Part 3.06 STRUCTURE BACKFILL, Paragraph B. Use of Select Fill</u> : "Use select fill underneath all structures ..." Where STRUCTURAL BACKFILL is called out on the plans use Select Fill.
55	On Specification Page 02741-5, please clarify your specification for "Bottom Course." Is this City DOT or State DOT? It appears to have been mixed up.	In specification page 02741-5, section B, Bottom Course; paragraph refers to "NYCDOT, Bureau of Highway Operations Standard Specifications, Section, Section 403 2.02, Aggregate-Coarse". The section "403 2.02" is incorrect. The correct section is 2.02. Specification 02741 is revised in Addendum #2 to refer to the correct NYCDOT

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		specification section. See Attachment C, Revisions to Specifications.
56	Regarding the MSE Wall Construction, what is the material specification for "Compacted Embankment Backfill" shown on Drawing R-218? Section 02317 does not call this out.	<p>In drawings R-018 and R-218, detail " TYPICAL M.S.E.S SECTION 1" the callout "Compacted Embankment Backfill" is deleted and replaced with "Select Fill" in Addendum #2. See Attachment D, Revisions to Drawings.</p> <p>For other locations where Compacted Embankment Backfill is called for: Specification Section 02317 states in <u>Part 3.08 EARTH EMBANKMENTS, Paragraph A.</u> "Make all earth embankments of approved cohesive common fill material." Therefore where COMPACTED EMBANKMENT BACKFILL is called out on the plans use Common Fill, Cohesive Materials.</p>
57	Regarding Drawing R-218, what asphalt pavement section is required above the MSE Wall?	See "TYPICAL HEAVY DUTY ASPHALT" detail on drawing C-041.
58	Sheet A-201 at the entry door is shown what looks like a DSNY logo plaque and lettering. We found no details or dimensions. Please clarify.	Details C2 and C4 on sheet A602 show sign and text to be used at main entrance. Same logo and text is to be used at location in question. Scale down text and sign provided to satisfy design intent shown on drawing A-201.
59	The purpose of this RFI is to clarify the steel piling coating requirements and confirm the properties of the welded double king pile as shown in the project plans. LB Foster is an integrator and supplier of the Combi-wall system as shown on the plan page S.-800 to S.-804. The Double PSp 900 King Piles derives its Section Modulus and MOI properties utilizing a welded connection with the locking bars. For the greatest project economy and quality, the assembly of this double box beam king pile is to take place at the producing mill per the manufacturer's recommendations. Key to this strength and published values is that the Double King Pile locking bar is a welded connection, compared to the mechanical interlock connection between the sheet piles interlocks. The joint connection is reflected under 09967 Coating for Steel Waterfront Structures section 3.5 (A through F). Requirement C. states "Coat all exposed steel surfaces of fender piles and ladders after completion of steel fabrication, including surfaces to received timber contact panels". Please confirm that due in part to the	The interior king pile cavity need not be coated. Each double king pile should be coated externally as a unit after fabrication. An addendum will specify casting a 2 foot deep concrete plug on top of each double king pile cavity after driving, cut-off and coating touch-up, to seal the cavity.

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	<p>manufacturing process that the inside of the double king pile box is excluded from coating requirements. This portion of the King Pile is not exposed to the outside elements of the Combi-wall system. The inside of the King Pile behaves much like the inside diameter of pipe pile, which rarely requires a coating system applied to the inside of the pipe. Please clarify and confirm the inside of the box double King Pile does not require coating.</p> <p>Please clarify and confirm in responses to bidding contractors that the interlocking bar between King Piles requires a welded connection.</p>	<p>The interlocking bars between king piles require welded connections, as explicitly detailed on drawing S-802.</p>
60	<p>The Con Ed Drawings included with the bid documents do not match the drawings listed in Schedule B of the Supplemental General Conditions. Please provide the drawings listed in Schedule B if they are to be part of this scope of work.</p>	<p>Schedule B of the Addendum to the General Conditions does not contain any reference to Con Ed. However, Schedule C does contain a drawing list which has several incorrect titles for these drawings. This Schedule C is revised in Addendum #2. See Attachment B, Revisions to the Addendum to the General Conditions. Please clarify your question if you were not referring to Schedule C.</p>
61	<p>Is the General Contractor responsible to rig and set the transformers in the block house or will Con Ed perform this operation?</p>	<p>The Contractor shall receive (units delivered to the property line by ConEdison), insure, transport, store (if needed), protect, install and connect and test the Utility transformers in accordance with the applicable Con Edison requirements. Refer to section 16210 Electric Service and drawing E-432 Division of Responsibility.</p>
62	<p>Sheet C-026.00 shows a structure SW of STMH-5. Is this structure STS #3? Is this an existing structure? Please clarify.</p>	<p>Drawing C-026.00 is revised in Addendum 2. The structure southwest of STMH-5 is storm water treatment unit 3. Details for the unit are provided on revised Drawing C-035 of Addendum #2. See Attachment D, Revisions to Drawings.</p>
63	<p>Per project S216-399A - Southwest Brooklyn Marine Transfer Station-Building Construction, our company is interested in the construction of the barges that will be necessary for transport of waste to this facility. Could you please provide an estimated timeline of this project? Most notably, (1) could you please provide the anticipated release date of a solicitation for the vessel construction, (2) the number of vessels that would be procured for this effort, (3) potentially the desired specifications of the barges needed, and (4) and estimated delivery</p>	<p>Procurement and construction of barges is not included in this contract. DSNY is currently nearing completion of the barge procurement process with barge vendors.</p>

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	schedule? We are eager to participate in this project and provide pricing for the transport of this waste.	
64	<p>1. Addenda #1 missing drawings A113.01, A114.01, A115.01, A141.01, A147.01, A900.01, R102.01, R302.01, M124.01, M216.01, P020.01 &amp; P063.01. Please provide.</p> <p>2. Schedule A from PLA missing, Please provide.</p> <p>3. Dwgs S701, S702 and S703 referred to. Please provide.</p>	<p>1. These drawings were mailed to purchasers of bid documents. Also, these drawings are now available on the website of New York City Department of Design and Construction (DDC) as of 9/18/12.</p> <p>2. Revised Schedule A is included in Addendum #1.</p> <p>3. Please clarify your question - references to Drawings S701, S702 and S703 could not be found.</p>
65	Can you please provide the Umbrella Liability Insurance Requirements, if any, for this project?	Insurance requirements are provided in the bid document Refer to Schedule A and Article 22 of the Contract for insurance provision requirements.
66	<p>{Drawing C-044.00, Bilge Water Hydrant Detail}</p> <p>This says "3" COUPLER W/ELBOW SWIVEL SEE SPECIFICATIONS". Please advise what specification. This says "3" ADAPTER (VALVE) SEE SPECIFICATIONS". Please advise what specification.</p> <p>2. This says "3" Female NPT x CAM AND GROOVE ADAPTER (HOSE CONNECTION)" and "3" MALE NPT X CAM AND GROOVE ADAPTER". Please provide assembly detail as to how these pieces connect to 'swivel'.</p>	<p>See Section 02081-6 Fire Hydrants, Post Hydrants and Appurtenances, Part 2.04.</p> <p>2. Swivel function is provided by the COUPLER W/ELBOW SWIVEL.</p>
67	Is the sign/plaque identified on Drawing A-201 located near the building entry part of this contract? If so, can you please provide the details for this sign/plaque identified on Drawing A-201 located near the building entry? Please provide sign type, sign dimensions, mounting details, and a specification, etc.	See response to Question 61.
68	Tag number 124-2 hardware set 10A is not in section 08711-20. Tag number 314-2 hardware set 18B is not in section 08711-20.	Hardware requirements are clarified in Addendum #2 by updating the Door Hardware Sets in Section 08711 and by clarifying the Door Schedule on Dwg A-604. See Attachment C, Revisions to Specifications and Attachment D, Revisions to Drawings.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT B – ADDENDUM TO GENERAL CONDITIONS**

1. Addendum to General Conditions, Amended Articles, Page 4 of 50. Revise “Article 1.26 Security Guards/Fire Guards on The Site is replaced with Section 01561 Site Security” to read “Article 1.26 Security Guards/Fire Guards on The Site is amended to include Section 01561 Site Security”.
2. Addendum to General Conditions, Schedule C – Contract Drawings, Page 18 of 50
  - a. For Sheet Number 34, Drawing Number C-034, revise "CONNECTION TO EXISTING BOX CULVERT" to read "SECTIONS".
3. Addendum to General Conditions, Schedule C – Contract Drawings, Page 28 of 50
  - a. For Sheet Number 644, Drawing Number E-339, revise "#343580, TRANSFORMER VAULT SECTIONS" to read "NOT USED".
  - b. For Sheet Number 645, Drawing Number E-340, revise "#343581, TRANSFORMER VAULT SECTIONS AND DETAILS" to read "NOT USED".
  - c. For Sheet Number 646, Drawing Number E-341, revise "#343582, DIVISION OF RESPONSIBILITY" to read "NOT USED".
  - d. For Sheet Number 647, Drawing Number E-342, revise "#343583, TRANSFORMER VAULT STRUCTURAL 1 OF 3" to read "CON EDISON DRAWING 343606-0-1 DIVISION OF RESPONSIBILITY".
  - e. For Sheet Number 648, Drawing Number E-343, revise "#343584, TRANSFORMER VAULT STRUCTURAL 2 OF 3" to read "CON EDISON DRAWING 343603-0-1 TRANSFORMER ENCLOSURE LAYOUT".
  - f. For Sheet Number 649, Drawing Number E-344, revise "#350764, MANHATTAN STRUCTURAL 3 OF 3" to read "CON EDISON DRAWING 343604-0-2 TRANSFORMER ENCLOSURE LAYOUT SECTION".
  - g. For Sheet Number 650, Drawing Number E-345, revise “#351052 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (PLAN)” to read "CON EDISON DRAWING 343605-0-1 TRANSFORMER VAULT DETAILS".
  - h. For Sheet Number 651, Drawing Number E-346, revise “#351053 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (SECTION A-A)” to read "CON EDISON DRAWING 343607-0-0 STRUCTURAL 1 OF 4 SECTION".
  - i. For Sheet Number 652, Drawing Number E-347, revise “#351054 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (SECTION B-B, C-C, D-D, E-E)” to read "CON EDISON DRAWING 343608-0-0 STRUCTURAL 2 OF 4 SECTION".
  - j. For Sheet Number 653, Drawing Number E-348, revise “#351055 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (DETAILS)” to read "CON EDISON DRAWING 350765-0-1 STRUCTURAL 3 OF 4 SECTION".
  - k. For Sheet Number 654, Drawing Number E-349, revise “#351056 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (DETAILS 30 THRU 38)” to read "CON EDISON DRAWING 350766-0-0 STRUCTURAL 4 OF 4 SECTION".



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**ATTACHMENT C – REVISIONS TO THE SPECIFICATIONS**

**Specification Section 01270 Measurement and Payment, Page 01270-1**

1. Part 1.02.A: Revise this part to read "Lump Sum Bid Item 1 (a) through (m) will constitute full compensation for all work and costs to complete the Project, with the exception of the other lump sum bid items, unit price bid items and allowances. Any work not specifically included in other Bid Schedule Lump Sum Items, Bid Schedule Unit Price Items, or Bid Schedule Allowances will be deemed included in Lump Sum Bid Item 1. Any work not specifically itemized in Lump Sum Bid Items 1 (a) through (l) will be deemed included in the Lump Sum Bid Item 1 (m)."

**Specification Section 01561 Site Security, Pages 01561-1**

2. Part 1.02.A: Revise this part to read "Comply with the requirements of General Conditions Article 1.26."
3. Part 1.03: Revise "ADDITIONAL SECURITY" to read "ADDITIONAL SECURITY REQUIREMENTS".
4. Part 1.03.A: Revise this part to read "Any security services furnished by the Contractor shall meet the requirements of the New York State Security Guard Act of 1992."
5. Part 1.03.B: Delete this part in its entirety.

**Specification Section 02316 Excavation, Page 02316-5**

Part 3.01.D.3: Revise to read "Whenever abandoned existing piles are encountered during excavation, they shall be demolished in accordance with Section 02222 – Demolition and Removals, unless otherwise indicated on the Contract Drawings."

**Specification Section 02371 Dust, Soil Erosion and Sedimentation Control, Pages 02371-1 through 02371-10**

Delete Section 02371 in its entirety and replace with new Section 02371, a copy of which is attached hereto.

**Specification Section 02457 Steel Sheet Piles, Page 02457-9**

Part 3.03L: In the second sentence, delete "on the piers".

**Specification Section 02741 Asphaltic Concrete Pavements, Page 02741-5**

Part 2.02.B. Revise "NYCDOT, Bureau of Highway Operations Standard Specifications, Section 403 2.02" to read "NYCDOT, Bureau of Highway Operations Standard Specifications, Section 2.02"

**Specification Section 08342, Overhead High Speed Fabric Doors, Page 08342-6**

Part 2.02.E.3: Revise to read as follows:

- "3. Provide covers at jamb mechanisms with swinging service panels. Lift-off panels will be allowed as required by adjacent curbs, rails or other obstructions."

**Specification Section 08711 Door Hardware, Page 08711-24**

Add the following "HS10A" before "HS11":

HS10A			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Electrified Latch Mortise Exit Device	ED5600 L9M57 M94 M92 SEC	CR	630
1 Power Supply	781N	CR	
1 Power Transfer	EPTL	CR	630
2 Closers	7500	NDC	689
2 Auto Flush Bolt	3810/3815	TBM	630
1 Coordinator	3094	TBM	626
2 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628
1 Astragal	By Door Mfg.		

Specification Section 11141 Diesel Fuel Dispensing Piping

1. Page 11141-1, Part 1.01.B: Replace "with integral pumps and meters" with ", submersible turbine pumps"
2. Page 11141-2
  - a. Part 1.04.A.1: Delete "Design a".
  - b. Part 1.04.B.1: At the end of this paragraph insert the following:
 

"a. Fuel system components shall be listed and approved by a third party testing laboratory for the types of fuels required herein."
3. Page 11141-4
  - a. Part 1.05.F: After this section insert the following:
 

"G. Submit proof of UL or other independent testing laboratory listing with submittal of equipment. Documentation shall show listed fuel compatibility as reviewed by third party testing laboratory."
  - b. Part 1.06.c: After this section insert the following:
 

"D. Furnish a list of additional items recommended by the manufacturer to assure efficient operation at this particular installation. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. A separate number shall properly identify each part."
4. Page 11141-7
  - a. Part 2.02.A.4: Replace "dispenser" with "fuel storage tank".
  - b. Part 2.02.B.1: Revise this part to read: "Weatherproof, lockable access door with continuous piano type hinge."
  - c. Part 2.02.B.5: Delete "per Section 15112 – Valves Smaller than 4 Inches"

- d. Part 2.02.B.6: Revise this part to read "20-gallon capacity spill catch pan with leak detector and one (1) gpm hand pump for spill removal with shutoff and check valves"
- e. Part 2.02.B.7: After this section insert the following:

"8. NEMA 4X rated"

- 5. Page 11141-8, Part 2.03.A.1: Delete ", gasoline, 85% ethanol (E85) and biodiesel (B20)"
- 6. Page 11141-9, Part 2.02.C.1: Delete ", fully removable," and "Hinges on access door shall not be acceptable".
- 7. Page 11141-12
  - a. Part 2.06.B: Delete "for diesel fuel".
  - b. Part 2.06.C: Delete "Section 15052, steel and stainless steel pipe and".
  - c. Part 2.06.G: Revise "tank s" to read "tanks".
  - d. Part 2.06.H: After this section insert the following:

"I. All fuel lines running through the building shall be encased in reinforced concrete as shown.

J. Piping shall be installed in accordance with manufacturer's recommendations and Section 15191 – Diesel Fuel Piping."

#### Specification Section 13851 Fire Alarm and Detection System

- 1. Page 13851-6, Part 1.06B.1.k: After this part, insert the following:

"1. Send an alarm signal to the Gas Safety Shut-Off Valve."

- 2. Page 13851-7, Part 1.06.F.3: After this part, insert the following:

"4. The system shall also provide a Post Fire Smoke Purge capability to enable the FDNY to operate fans so as to clear smoke from the building after a fire has been suppressed."

- 3. Page 13851-17, Part 2.03A: Revise the first sentence to read as follows:

"A Purge Panel shall be provided to allow for a "post Fire Smoke Purge" by the Fire Department."

#### Specification Section 13915 Fire-Suppression Piping

- 1. Page 13915-1, Part 1.02L: After this part, insert the following:

"M. Section 15771 – Heat Tracing System  
N. Section 15140 – Domestic Water Piping"

- 2. Page 13915-2, Part 1.03A.16: After this part, add the following:

"17. City of New York Local Law 58/09  
18. City of New York Local Law 63/09"

- 3. Page 13915-3

- a. Part 1.05C.2.d: After this part, insert the following:

- "e. Fire Protection and Plumbing Room: Ordinary Hazard Group I"
  - b. Part 1.05C.3.d: After this part, insert the following:
    - "e. Fire Protection and Plumbing Room: 130 sq.ft.
4. Page 13915-5, Part 1.07F: In the second line, after "Building Code of the City of New York" insert ", NFPA 14".
5. Page 13915-6
  - a. Part 1.07G:
    - (1) After "new sprinkler" insert "and standpipe".
    - (2) After "test connections" insert ", fire hoses".
  - b. Part 1.08A: After "equipment" insert "monorails, soffits".
6. Page 13915-9, Part 2.03A: After "180 deg F" insert ", UL-listed or FM approved".
7. Page 13915-10, Part 2.04A: After "system fluid" insert ", UL-listed or FM approved".
8. Page 13915-17, Part 2.09A.3.a: After "UL listed" insert "or FM approved".
9. Page 13915-18
  - a. Part 2.09A.3.b: After "F-AIC-01" insert "F-AIC-02".
  - b. Part 2.10.B: After this part, insert the following:

"C. Corrosion-resistant sprinklers shall be installed in areas exposed to atmospheric and other corrosive conditions."
10. Page 13915-21, Part 2.11D: Revise "UL approved" to read "UL-listed or FM approved".
11. Page 13915-28, Part 3.10M: After "NFPA 13" insert ", structural specifications".
12. Page 13915-30, Part 3.10V: After this part, insert the following:

"W. Corrosion protective coating shall be applied to all unprotected exposed surfaces of the wet and dry sprinkler systems and standpipe system."
13. Page 13915-31, Part 3.12A.2: Delete "Pendent sprinklers".

Specification Section 13921 Electric-Drive, Centrifugal Fire Pumps

1. Page 13921-1, Part 1.02A-F: Revise to read as follows:
- A. Section 07842 - Fire Resistive Joint System
  - B. Section 09912 - Interior Painting
  - C. Section 10520 - Fire-Protection Specialties
  - D. Section 13851 - Fire Alarm and Detection Devices
  - E. Section 13915 - Fire Suppression Piping
  - F. Section 13953 - Foam/Water Fire Suppression System
  - G. Section 15060 - Hangers and Supports
  - H. Section 15076 - Piping and Equipment ID
  - I. Section 16060 - Grounding

J. Section 16121 - Wires and Cables 600 Volts and Below"

2. Page 13921-5, Part 2.01D.1: Revise "F-FP-01" to read "F-FRP-01".

Specification Section 13953 Foam/Water Fire-Suppression System

1. Page 13953-1, Part 1.02A: Revise "07582" to read "07842".
2. Page 13953-2
  - a. Part 1.03O: After this part, insert the following:

"P. City of New York Local Law 58/09  
Q. City of New York Local Law 63/09"
  - b. Part 1.04A: After "AFFF" insert "(aqueous film forming foam)".
3. Page 13953-7
  - a. Part 2.02A.2: Revise "polymerr" to read "polymer".
  - b. Part 2.02A.5: After this part, add the following:

"6. 55-Gallon Drums Foam Concentrate: Provide 4 (four) 55-gallon drums of 3% AR-AFFF Foam Concentrate to allow tank to be refilled after testing."
4. Page 13953-8, Part 2.04D: After "temperatures" insert "and corrosion conditions".
5. Page 13953-11, Part 2.08A: After "180 deg F " insert "UL-listed or FM approved".
6. Page 13953-12, Part 2.09A: After fluid insert "UL-listed or FM approved".
7. Page 13953-17
  - a. Part 3.05J: Revise to read as follows:

"J. Hangers and Supports: Comply with NFPA 13, structural specification and Specification Section 15060 for stainless steel hanger materials. All hangers and supports shall be UL listed or FM approved, stainless steel and double nutted.

    1. Install sprinkler piping according to NFPA 13 and NFPA 16."
  - b. Part 3.06A: After "Install" insert "UL-listed or FM approved".
8. Page 13953-18, Part 3.07A.1: After this part, insert the following:

"2. Install corrosion-resistant sprinkler heads in Foam-Water Fire Suppression System."

Specification Section 14511 Container Transport System

1. Page 14511-4, Part 1.04E.5. After this part, add the following:

"6. The shuttle's battery system will be sized to operate for a full 16 hours with or without opportunity charging."
2. Page 14511-6, Part 2.01A: Revise to read as follows:

"A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Jervis B. Webb, Farmington Hills, Michigan (formerly Mentor AGVS)
  2. Bruno Engineering, PC, Price, Utah
  3. Or approved equal"
3. Page 14511-9, Part 2.02B.7.a: Delete the words "and be".

Specification Section 14601 Container Lidding System

1. Page 14601-4, Part 1.08A.4: Delete "and be packaged separately for each of the two stations".
2. Page 14601-6, Part 2.02A.17: After "handrail" insert "with toe plate".
3. Page 14601-10
  - a. Part 2.02B.8: After "mounted on the" insert "top of the".
  - b. Part 2.02B.9.b: Revise "position" to read "station".
  - c. Part 2.02B.9.g.(1): Revise "twist-loc" to read "twist-lock".
4. Page 14601-12, Part 3.01D: in the eighth line, revise "contractor" to read "Contractor".

Specification Section 14696 Mooring Capstans

1. Page 14696-4, Part 2.02E.4: Revise "45 FPM single speed" to read "35 FPM variable speed".
2. Page 14696-6, Part 3.01B.3: Revise "zero speed" to read "no specified speed".

Specification Section 15121 Pipe Expansion and Seismic Fittings

Page 15121-3, Part 2.01C: Delete this part in its entirety.

Specification Section 15190 Fuel Gas Piping, Page 15190-4

1. Part 2.01A.6.b: Delete this part in its entirety.
2. Part 2.01A.6.c: Delete this part in its entirety.

Specification Section 15540 Fuel Fired Heaters

1. Page 15540-3, Part 2.02B.1: Revise to read as follows:

"1. The gas heat section shall be natural gas, indirect fired and shall be completely factory assembled, wired and tested at the factory before shipment. The indirect gas heater consists of the heat exchanger, power burner, gas train, flame management controls and control panel. The entire section shall bear a UL or CUL label for Commercial-Industrial Gas Heating Equipment (ANSI / UL Standard 795) and Industrial Gas-Fired Package Furnaces (CGA Standard 3.2-1976). It shall have double wall construction with fiberglass insulation and a burner access door on the same side as the fan motor access. All burner and control components shall be housed in the burner vestibule complete with a combustion air intake louver. It is an integral part of the entire air-handling system."

Specification Section 15900 HVAC Controls

1. Page 15900-8, Part 2.02A.2: Revise to read as follows:

- “2. Coordinate power and wiring requirements for all equipment provided under Division 15 with Division 16.”
2. Page 15900-9, Part 2.02B: Revise to read as follows:
- “B. Provide all power wiring, control wiring and communication wiring, associated conduit, transformers and appurtenances interconnecting all equipment provided under Division 15, except as specifically specified to be provided otherwise, including but not limited to the following:”
3. Page 15900-9, Part 2.02C: Revise to read as follows:
- “C. Provide all equipment, control wiring, communication wiring and associated conduit, transformers and appurtenances interconnecting the following equipment provided under Division 15.”
4. Page 15900-9, Part 2.02D: Revise to read as follows:
- “D. Wiring and associated conduit for the following equipment provided by Division 15 is provided under Division 16.”
5. Page 15900-10, Part 2.02E: Revise to read as follows:
- “E. Provide power equipment and control wiring terminations in the TCP under Division 15. Control wiring and conduit between the MCC and TCP is provided under Division 16.”
6. Page 15900-10, Part 2.02F: Revise to read as follows:
- “F. Power, control and communications wiring and associated conduit interconnecting certain pieces of equipment provided under Division 15 to certain pieces of equipment provided under Division 16 are provided under Division 16.”
7. Page 15900-9, Part 2.02G.1: Revise to read as follows:
- “1. The communication wiring and conduit between TCP(s), and SCADA System is provided under Division 16.”
8. Page 15900-45, Part 3.03JA.2: Change the word “Foreman’s” to read “Supervisor’s”.

Specification Section 16060 Grounding, Page 16060-3

Part 2.04B: After this part, insert the following:

“2.05 EXPOSED REFERENCE GROUND BUS

- A. Provide copper bar of ¼” x 2” dimension where indicated.
- B. Provide insulated standoffs to securely fasten and support the ground bar from the wall or other surface where they are located.

- C. Use two hole Elugs and permanent connection to same from grounding electrode conductors and bonds."

Specification Section 16210 Electric Service

1. Page 16210-1, Part 1.04B: Revise to read as follows:

"B. The facility services will continue from EMH-1A and EMH-1B through manholes EMH-2A & 2B, respectively, and on to the MTS building. They shall extend, as shown on Contract Drawings. Upon entering the footprint of the facility they will run under the pier level, above the pit topping slab, below the grade and support beams, to Electric Room 1- where they will terminate in the Utility structures at each end of the Facility main switchgear."

2. Page 16210-2, Part 1.04C: Revise to read as follows:

"C. Primary, medium voltage feeders shall extend from the property line Manholes EMH-1 & EMH-2, respectively, to the termination at the Utilities transformers which are located in the Blockhouse."

Specification Section 16230 Packaged Engine Generator Systems

1. Page 16230-1

- a. Part 1.01A: Revise "750kW" to read "900kW".  
b. Part 1.02.8: After this part, insert the following:

- "9. Section 16443 – Panelboards  
10. Section 16460 – General Purpose Dry Type Transformers  
11. Section 16491 – Control Components and Devices"

2. Page 16230-2

- a. Part 1.03A.10: After this part, insert the following:

"11. FEIS - DSNY Final Environmental Impact Study

- b. Part 1.04B: Revise "750 kW" to read "900 kW".

3. Page 16230-5

- a. Part 2.01A.4.b: After this part, add the following:

"c. Simplx"

- b. Part 2.01A.5.c: After this part, add the following:

"d. Robinson"

4. Page 16230-6, Part 2.02A.6: Revise the last sentence to read:

"Exhaust noise and other enclosure noises shall be within the limits set by the NYC Noise Control Ordinances and the DSNY FEIS."

5. Page 16230-7, Part 2.02B.1: Revise "750 kW, 937 kVA" to read "900 kW, 1125 kVA".



6. Page 16230-8, Part 2.02D.1 through Part 2.02D.3: Revise to read as follows:
  - “1. Provide one low-voltage, power circuit breaker rated at 1400T/1600F amperes at 480 volts, 3-phase, 60-hertz to serve the 480 main switchgear B bus.
  2. Provide one low-voltage, power circuit breaker rated at 600T/ 800F amperes at 480 volts, 3-phase, 60-hertz to serve the fire pump controller automatic transfer switch. Install in an enclosure separated by 12” minimum from the non-emergency loads in the output panel enclosure.
  3. Provide one 700T/800F amperes low voltage power circuit breaker rated at 480 volts, 3-phase, 60-hertz to serve the Load Bank.”
7. Page 16230-9, Part 2.02D.6. Revise to read as follows:
  - “6. Provide instrument and relay current transformers and potential transformers as required within the structure housing the circuit breakers.”

Specification Section 16443 Panelboards

1. Page 16443-2, Part 2.02B: Delete the sentence “The total number of overcurrent protective devices shall be limited to 42 single pole connections or the equivalent multi-pole load.”
2. Page 16443-2, Part 2.02B.1: Delete the word “Provide”.
3. Page 16443-3, Part 2.02B.7. Revise to read as follows:
  - “7. Provide a Fused Cut Out Panel (FCO) of the type required by the NYCEC and the FDNY for emergency power supply to the Building Wide Alarm System Loads.”
4. Page 16443-4, Part 2.03H: After this part, insert the following:

“2.04 FUSES

  - A. Provide 120 volt fuses for branch circuit application in the FCO panel. Fuse interrupting ratings shall be 10,000 amps.”

Specification Section 16445 Motor Control Centers

1. Page 16445-5, Part 2.01A.2: Revise “Transient Voltage Surge Suppression (TVSS)” to read “Surge Protective Devices (SPD)”.
2. Page 16445-8, Part 2.02E.8: Revise to read as follows:
  - “8. Provide communication cables from the microprocessor-based metering system and microprocessor-based overload protection systems as well as cables for monitoring the status of SPDs to a single terminal block located in the incoming line structure.
  9. Provide terminals for all external control or monitoring functions at each starter or circuit protective device (MCP or MCCB).”
3. Page 16445-9
  - a. Part 2.02F.5: Revise to read as follows:

“5. Equip each starter with seal in and all required auxiliary contacts.”

b. Part 2.02G. At the end of this part, add the following:

“Base interrupting rating on assembled equipment nameplate per recognized standards.”

4. Page 16445-10, Part 2.02I. Revise the last sentence to read as follows:

“No Q or G frame or miniature circuit breakers will be accepted.”

5. Page 16445-11, Part 2.02L. At the end of this part, add the following:

“Devices shall be “Machine Tool Rated”.

6. Page 16445-12, Part 2.02P: Revise to read as follows:

“P. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit. Schematic shall include all devices, internal and external to the unit and motor control center and all required terminations for control and monitoring. Tag all terminals with number and description.”

Specification Section 16600 Lighting Controls, Pages 16600-1 through 16600-14  
Insert new Section 16600 Lighting Controls, a copy of which is attached hereto.

Specification Section 16745 Telephone System

1. Page 16745-2, Part 1.05D: After this part, insert the following:

“E. The Owner shall contract with the telephone/data utility for service to the MTS and for T-1 Head-End equipment and Instruments. The Contractor shall supply site preparation for the Head End equipment, all in site complex distribution, including raceway, boxes and cabinets, wiring per the applicable Div 16 specification.

F. In addition to the VOIP and Data distribution the Contractor shall install “Hard Wired” instruments and copper conductors to independent outside lines. The Owner shall arrange for these “Outside-Direct Lines” and those instruments with the Utility supplier.”

2. Page 16745-5, Part 2.01A.1: Delete this part in its entirety.

3. Page 16745-7, Part 2.03A. Revise “Supply Systems” to read “Supplies”.

4. Page 16745-9, Part 2.07: Revise “PERSONNEL AREA SERVER ROOM EQUIPMENT RACKS” to read “SERVER ROOM EQUIPMENT RACKS”.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT D – REVISIONS TO THE DRAWINGS**

**REFER TO DRAWING C-001.00**

1. Revise the first line of General Note 12 to read “EXCEPT WHERE INDICATED ON OTHER CONTRACT DRAWINGS, REMOVAL OF EXISTING FOUNDATION PILES SHALL BE AS FOLLOWS:”
2. Revise General Note 12.b to read “ “STEEL OR TIMBER PILES NOT INTERFEREING WITH FOUNDATION PILE LOCATIONS FOR NEW WORK SHALL BE EXTRACTED AS ABOVE OR CUT AS SPECIFIED IN SECTION 02222 – DEMOLITION AND REMOVALS.”

**REFER TO DRAWING C-002.00**

Revise the grid coordinates as follows:

1. Revise “E 984600” to read “E 984400”.
2. Revise “E 984700” to read “E 984500”.
3. Revise “E 984800” to read “E 984600”.
4. Revise “E 984900” to read “E 984700”.
5. Revise “E 985000” to read “E 984800”.
6. Revise “E 985100” to read “E 984900”.
7. Revise “E 985200” to read “E 985000”.
8. Revise “E 985300” to read “E 985100”.
9. Revise “E 985400” to read “E 985200”.
10. Revise “E 985500” to read “E 985300”.
11. Revise “E 985600” to read “E 985400”.
12. Revise “E 985700” to read “E 985500”.
13. Revise “E 985800” to read “E 985600”.

**REFER TO DRAWING C-003.00**

Revise the grid coordinates as follows:

1. Revise “E 984400” to read “E 984200”.
2. Revise “E 984500” to read “E 984300”.
3. Revise “E 984600” to read “E 984400”.

4. Revise "E 984700" to read "E 984500".
5. Revise "E 984800" to read "E 984600".
6. Revise "E 984900" to read "E 984700".
7. Revise "E 985000" to read "E 984800".
8. Revise "E 985100" to read "E 984900".
9. Revise "E 985200" to read "E 985000".
10. Revise "E 985300" to read "E 985100".
11. Revise "E 985400" to read "E 985200".
12. Revise "E 985500" to read "E 985300".
13. Revise "E 985600" to read "E 985400".

**REFER TO DRAWING C-004.00**

Revise the grid coordinates as follows:

1. Revise "E 984500" to read "E 984300".
2. Revise "E 984600" to read "E 984400".
3. Revise "E 984700" to read "E 984500".
4. Revise "E 984800" to read "E 984600".
5. Revise "E 984900" to read "E 984700".
6. Revise "E 985000" to read "E 984800".

**REFER TO DRAWING C-005.00**

Revise the grid coordinates as follows:

1. Revise "E 984550" to read "E 984350".
2. Revise "E 984600" to read "E 984400".
3. Revise "E 984700" to read "E 984500".
4. Revise "E 984800" to read "E 984600".
5. Revise "E 984900" to read "E 984700".
6. Revise "E 985000" to read "E 984800".
7. Revise "E 985050" to read "E 984850".

**REFER TO DRAWING C-006.00**

Revise the grid coordinates as follows:

1. Revise "E 984550" to read "E 984350".
2. Revise "E 984600" to read "E 984400".
3. Revise "E 984700" to read "E 984500".
4. Revise "E 984800" to read "E 984600".
5. Revise "E 984900" to read "E 984700".
6. Revise "E 985000" to read "E 984800".
7. Revise "E 985050" to read "E 984850".

**REFER TO DRAWING C-008.00**

Revise the grid coordinates as follows:

1. Revise "E 984400" to read "E 984200".
2. Revise "E 984500" to read "E 984300".
3. Revise "E 984600" to read "E 984400".
4. Revise "E 984700" to read "E 984500".
5. Revise "E 984800" to read "E 984600".
6. Revise "E 984900" to read "E 984700".
7. Revise "E 985000" to read "E 984800".
8. Revise "E 985100" to read "E 984900".
9. Revise "E 985200" to read "E 985000".
10. Revise "E 985300" to read "E 985100".
11. Revise "E 985400" to read "E 985200".
12. Revise "E 985500" to read "E 985300".
13. Revise "E 985600" to read "E 985400".

**REFER TO DRAWING C-009.00**

Revise the grid coordinates as follows:

1. Revise "E 984600" to read "E 984400".
2. Revise "E 984700" to read "E 984500".

3. Revise "E 984800" to read "E 984600".
4. Revise "E 984900" to read "E 984700".

**REFER TO DRAWING C-010.00**

Revise the grid coordinates as follows:

1. Revise "E 985000" to read "E 984800".
2. Revise "E 985100" to read "E 984900".
3. Revise "E 985200" to read "E 985000".
4. Revise "E 985300" to read "E 985100".
5. Revise "E 985400" to read "E 985200".
6. Revise "E 985500" to read "E 985300".

**REFER TO DRAWING C-011.00**

Revise the grid coordinates as follows:

1. Revise "E 984900" to read "E 984700".
2. Revise "E 985000" to read "E 984800".
3. Revise "E 985100" to read "E 984900".
4. Revise "E 985200" to read "E 985000".
5. Revise "E 985300" to read "E 985100".
6. Revise "E 985350" to read "E 985150".

**REFER TO DRAWING C-012.00**

Revise the grid coordinates as follows:

1. Revise "E 984900" to read "E 984700".
2. Revise "E 985000" to read "E 984800".
3. Revise "E 985100" to read "E 984900".
4. Revise "E 985200" to read "E 985000".
5. Revise "E 985300" to read "E 985100".
6. Revise "E 985400" to read "E 985200".

**REFER TO DRAWING C-013.01**

Replace Drawing C-013.01 with Drawing C-013.02, a copy of which is attached hereto.

**REFER TO DRAWING C-014.00**

Replace Drawing C-014.0 with Drawing C-014.01, a copy of which is attached hereto.

**REFER TO DRAWING C-015.01**

Replace Drawing C-015.01 with Drawing C-015.02, a copy of which is attached hereto.

**REFER TO DRAWING C-016.00**

Replace Drawing C-016.00 with Drawing C-016.01, a copy of which is attached hereto.

**REFER TO DRAWING C-017.01**

Replace Drawing C-017.01 with Drawing C-017.02, a copy of which is attached hereto.

**REFER TO DRAWING C-018.01**

1. Revise the grid coordinates as follows:
  - a. Revise "E 985200" to read "E 985000".
  - b. Revise "E 985300" to read "E 985100".
  - c. Revise "E 985400" to read "E 985200".
  - d. Revise "E 985500" to read "E 985300".
  - e. Revise "E 985600" to read "E 985400".
2. Revise label "12' CHAIN LINK FENCE" to read "8' CHAIN LINK FENCE".

**REFER TO DRAWING C-020.00**

Revise the grid coordinates as follows:

1. Revise "E 984400" to read "E 984200".
2. Revise "E 984500" to read "E 984300".
3. Revise "E 984600" to read "E 984400".
4. Revise "E 984700" to read "E 984500".
5. Revise "E 984800" to read "E 984600".
6. Revise "E 984900" to read "E 984700".
7. Revise "E 985000" to read "E 984800".
8. Revise "E 985100" to read "E 984900".
9. Revise "E 985200" to read "E 985000".
10. Revise "E 985300" to read "E 985100".
11. Revise "E 985400" to read "E 985200".
12. Revise "E 985500" to read "E 985300".
13. Revise "E 985600" to read "E 985400".

**REFER TO DRAWING C-021.00**

Revise the grid coordinates as follows:

1. Revise "E 984600" to read "E 984400".

2. Revise "E 984700" to read "E 984500".
3. Revise "E 984800" to read "E 984600".
4. Revise "E 984900" to read "E 984700".

**REFER TO DRAWING C-022.00**

Revise the grid coordinates as follows:

1. Revise "E 984900" to read "E 984700".
2. Revise "E 985000" to read "E 984800".
3. Revise "E 985100" to read "E 984900".
4. Revise "E 985200" to read "E 985000".
5. Revise "E 985300" to read "E 985100".
6. Revise "E 985350" to read "E 985150".

**REFER TO DRAWING C-023.00**

1. Revise the grid coordinates as follows:
  - a. Revise "E 984900" to read "E 984700".
  - b. Revise "E 985000" to read "E 984800".
  - c. Revise "E 985100" to read "E 984900".
  - d. Revise "E 985200" to read "E 985000".
  - e. Revise "E 985300" to read "E 985100".
  - f. Revise "E 985350" to read "E 985150".
2. Add the following note to the drawing, "5. DEMOLISH EXISTING 12" ST AND CONCRETE CRADLE".

**REFER TO DRAWING C-024.00**

Revise the grid coordinates as follows:

1. Revise "E 985000" to read "E 984800".
2. Revise "E 985100" to read "E 984900".
3. Revise "E 985200" to read "E 985000".
4. Revise "E 985300" to read "E 985100".
5. Revise "E 985400" to read "E 985200".
6. Revise "E 985500" to read "E 985300".

**REFER TO DRAWING C-025.00**

Replace Drawing C-025.00 with Drawing C-025.01, a copy of which is attached hereto.

**REFER TO DRAWING C-026.00**

Replace Drawing C-026.00 with Drawing C-026.01, a copy of which is attached hereto.



**REFER TO DRAWING C-027.00**

Replace Drawing C-027.00 with Drawing C-027.01, a copy of which is attached hereto.

**REFER TO DRAWING C-028.00**

Replace Drawing C-028.00 with Drawing C-028.01, a copy of which is attached hereto.

**REFER TO DRAWING C-029.00**

Replace Drawing C-029.00 with Drawing C-029.01, a copy of which is attached hereto.

**REFER TO DRAWING C-030.00**

Replace Drawing C-030.00 with Drawing C-030.01, a copy of which is attached hereto.

**REFER TO DRAWING C-032.00**

Replace Drawing C-032.00 with Drawing C-032.01, a copy of which is attached hereto.

**REFER TO DRAWING C-033.00**

Replace Drawing C-033.00 with Drawing C-033.01, a copy of which is attached hereto.

**REFER TO DRAWING C-034.00**

In Section 3/C-029 revise text "FLOW FROM ST MH-12" to read "FLOW FROM ST MH-16".

**REFER TO DRAWING C-035.00**

Replace Drawing C-035.00 with Drawing C-035.01, a copy of which is attached hereto.

**REFER TO DRAWING C-042.00**

Delete detail "CONC CRADLE ON PILES DETAIL" in its entirety.

**REFER TO DRAWING C-044.00**

1. For Detail "BILGE WATER HYDRANT DETAIL" in the center of the page, below "NOT TO SCALE" add "TYPICAL FOR 2 LOCATIONS SEE SECTION 2".
2. For Detail "BILGE WATER HYDRANT DETAIL" on the right side of the page, make the following changes:
  - a. Under "NOT TO SCALE" add "1 LOCATION, SEE SECTION 4".
  - b. Revise "4" BILGE" to read "8" BILGE".
  - c. Revise "4" x 3" REDUCER" to read "8" x 3" REDUCER".

**REFER TO DRAWING A-114.01**

1. Relocate door 215-1 16-inch to the West along column line D.
2. Reposition bollards on either side of Door 215-1 in such a way that the edge of the bollards are tangent to each side of the masonry opening.

**REFER TO DRAWING A-530.00**

In window detail E – OPERATIONS ROOM, revise dimension "9'-0 1/4" " to read "9'-0" ".

**REFER TO DRAWING A-604.00**

1. In General Note 1, revise "LIFT OF" to read "SWING".
2. In the Door Schedule, under hardware set column, revise "8A" to read "7C".

**REFER TO DRAWING S-112.00**

Revise the call-out at the bottom edge of the plan that points to the carriage rail pocket located 4'-6" plan east of Column Line 5 that currently reads "9"x1'-6" POCKET (6 THUS) SEE DWG S-126" to read "9"x1'-6" POCKET (8 THUS) SEE DWG S-126".

**REFER TO DRAWING S-202.00**

Replace Drawing S-202.00 with Drawing S-202.01, a copy of which is attached hereto.

**REFER TO DRAWING S-203.00**

Revise the north-south dimension that reads "11'-3"" located near the intersection of Column Lines G and 16, and dimensioning the raised curb for the Maintenance Bay office to read "10'-7"".

**REFER TO DRAWING S-212.00**

Replace Drawing S-212.00 with Drawing S-212.01, a copy of which is attached hereto.

**REFER TO DRAWING S-216.00**

Replace Drawing S-216.00 with Drawing S-216.01, a copy of which is attached hereto.

**REFER TO DRAWING S-452.00**

In Section 5:

1. Replace the call-out that reads "T/GRATING EL 74.58" with "T/GRATING EL 76.83".
2. Replace the call-out that reads "T/C10 EL 74.42" with "T/C10 EL 76.67".
3. Replace the call-out that reads "T/WALL EL 66.17" with "T/WALL EL 68.42".
4. Replace the call-out that reads "T/MEZZANINE EL 65.75" with "T/MEZZANINE EL 68.00".

**REFER TO DRAWING S-610.00**

1. In Section 1, replace the call-out that reads "PEA GRAVEL BACKFILL" with "PEA GRAVEL BEDDING".
2. In Section 3, delete the vertical dimension on the reinforced concrete slab that reads "2'-0"".
3. In STORMWATER TREATMENT SYSTEM NO 1 SLAB PLAN:
  - a. Revise the longitudinal dimension of the overall slab that currently reads "21'-0"" to read "18'-0"".
  - b. Revise the longitudinal dimension of the pile spacing that currently reads "16'-0"" to read "13'-0"".
  - c. Revise the title that currently reads "STORMWATER TREATMENT SYSTEM NO 1 SLAB PLAN" to read "STORMWATER TREATMENT SYSTEM NO 2 SLAB PLAN".
4. In STORMWATER TREATMENT SYSTEM NO 2 SLAB PLAN, revise the title to read "STORMWATER TREATMENT SYSTEMS NO 1 & 3 SLAB PLAN".

**REFER TO DRAWING S-802.00**

Replace Drawing S-802.00 with Drawing S-802.01, a copy of which is attached hereto.

**REFER TO DRAWING S-803.00**

Replace Drawing S-803.00 with Drawing S-803.01, a copy of which is attached hereto.

**REFER TO DRAWING S-804.00**

Replace Drawing S-804.00 with Drawing S-804.01, a copy of which is attached hereto.

**REFER TO DRAWING S-900.00**

Replace Drawing S-900.00 with Drawing S-900.01, a copy of which is attached hereto.

**REFER TO DRAWING S-901.00**

Replace Drawing S-901.00 with Drawing S-901.01, a copy of which is attached hereto.

**REFER TO DRAWING S-903.00**

Replace Drawing S-903.00 with Drawing S-903.01, a copy of which is attached hereto.

**REFER TO DRAWING S-905.00**

Replace Drawing S-905.00 with Drawing S-905.01, a copy of which is attached hereto.

**REFER TO DRAWING R-018.00**

In detail "TYPICAL M.S.E.S SECTION 1/R-051, delete text "COMPACTED EMBANKMENT BACKFILL" and replace with text "SELECT FILL"

**REFER TO DRAWING R-218.00**

In detail "TYPICAL M.S.E.S SECTION 1/R-051, delete text "COMPACTED EMBANKMENT BACKFILL" and replace with text "SELECT FILL".

**REFER TO DRAWING R-251.00**

Delete the callout "CONCRETE DECK SLAB WITH MICRO SILICA WEARING SURFACE" which is located at the bottom right of plan detail near Matchline A-A.

**REFER TO DRAWING R-252.00**

Replace Drawing R-252.00 with Drawing R-252.01, a copy of which is attached hereto.

**REFER TO DRAWING M-113.00**

Delete orphan text and leader reading "EXISTING BOLLARD (TYP 2 PLACES)" located between Column Lines 5 and 8.

**REFER TO DRAWING M-121.00**

Delete 4" PD, 4" CW, 6" SIA, and the two 6" FPW lines, heat trace circuit notations and note reading "UNDER RAMP (SEE NOTE 2 & 4)" located south of Column Line 17 and between Column Lines B and C.

**REFER TO DRAWING M-212.00**

Replace Drawing M-212.00 with Drawing M-212.01, a copy of which is attached hereto.

**REFER TO DRAWING M-216.01**

Add note 9 to read "ALL ODOR CONTROL, DUST CONTROL AND SERVICE WATER PIPING OUTSIDE THE ODOR CONTROL ROOM SHALL BE HEAT TRANCED AND INSULATED".

**REFER TO DRAWING M-218.00**

1. Add note 7 to read "ODOR CONTROL DIFFUSERS AND PIPE ARRANGEMENT SIMILAR FOR ALL EXHAUST FANS. SEE HVAC DWGS FOR HVAC SYSTEM. SEE PLUMBING DRAWINGS FOR ODOR CONTROL DRAIN PIPING".
2. In section 10 revise the call-out for the exhaust duct to read "EXHAUST DUCT (SEE NOTE 7)".
3. In section 10 revise the call-out for the ½" drain to read "1/2" DRAIN (TIE INTO DUCT DRAIN SEE NOTE 7).

**REFER TO DRAWING M-310.00**

In the ODOR CONTROL DIAGRAM relocate the heat trace circuit number 10 symbol from the EQUIPMENT LOCATED INSIDE ODOR CONTROL ROOM side to the EQUIPMENT LOCATED OUTSIDE ODOR CONTROL ROOM side of the diagram.

**REFER TO DRAWING M-630.00**

Replace Drawing M-630.00 with Drawing M-630.01, a copy of which is attached hereto.

**REFER TO DRAWING M-640.00**

Replace Drawing M-640.00 with Drawing M-640.01, a copy of which is attached hereto.

**REFER TO DRAWING H-101.00**

Replace Drawing H-101.00 with Drawing H-101.01, a copy of which is attached hereto.

**REFER TO DRAWING H-102.00**

Replace Drawing H-102.00 with Drawing H-102.01, a copy of which is attached hereto.

**REFER TO DRAWING H-104.00**

Replace Drawing H-104.00 with Drawing H-104.01, a copy of which is attached hereto.



**REFER TO DRAWING H-106.00**

Replace Drawing H-106.00 with Drawing H-106.01, a copy of which is attached hereto.

**REFER TO DRAWING H-108.00**

Replace Drawing H-108.00 with Drawing H-108.01, a copy of which is attached hereto.

**REFER TO DRAWING H-110.00**

1. Remove air monitoring alarm station  (Horn and Light) in Loading Area at column line C-16.
2. Add air monitoring alarm station  (Horn and Light) in Loading Area at column line F-16, north for gas sensors symbol.
3. Revise label for Gas monitoring Panel (GMP) by column line D-14 to read from "F-GMP-01" to F-GMP-01A".

**REFER TO DRAWING H-200.00**

Replace Drawing H-200/00 with Drawing H-200.01, a copy of which is attached hereto.

**REFER TO DRAWING H-203.00**

Replace Drawing H-203.00 with Drawing H-203.01, a copy of which is attached hereto.

**REFER TO DRAWING H-206.00**

Replace Drawing H-206.00 with Drawing H-206.01, a copy of which is attached hereto.

**REFER TO DRAWING H-401.00**

Add the following draft inducer fan to the "CHIMNEY AUTOMATION SYSTEM" schedule.

UNIT I.D : F-DIF-03  
SYSTEM (S): WATER HEATER  
TYPE: MODULATING DRAFT INDUCER  
FAN: RSIF 146  
HP/RPM: 1/10 HP / 1600 RPM  
ELEC CHAR.:  
- V/PH/Hz 120/1/60  
- AMP 1.2  
MODULATING PRESSURE CONTROLLER:  
- EBC10 INTERLOCK CONTROLLER  
- PDS DRAFT PRVING SWITCH  
- FSC FAN SPEED CONTROLLER  
ELEC CHAR.:  
- V/PH/Hz 120/1/60  
- AMP 6.3  
MANUFACTURER: ENERVEX  
REMARKS/NOTES: MECHANICAL DRAFT SYSTEM

**REFER TO DRAWING P-010.00**

Revise Note 1 to read as follows:

- "1. COORDINATE AND INSTALL ALL DRAINAGE LINES THAT ARE LOCATED IN THE CONCRETE PILE CAPS AND CONCRETE BEAMS PRIOR TO THE PLACING OF THE CONCRETE.
2. SEE PIPING SCHEDULE ON DRAWING P-080."

**REFER TO DRAWING P-011.00**

Revise Note 1 to read as follows:

- "1. COORDINATE AND INSTALL ALL DRAINAGE LINES THAT ARE LOCATED IN THE CONCRETE PILE CAPS AND CONCRETE BEAMS PRIOR TO THE PLACING OF THE CONCRETE.
2. SEE PIPING SCHEDULE ON DRAWING P-080."

**REFER TO DRAWING P-020.01**

Replace Drawing P-020.01 with Drawing P-020.02, a copy of which is attached hereto.

**REFER TO DRAWING P-030.00**

Replace Drawing P-030.00 with Drawing P-030.01, a copy of which is attached hereto.

**REFER TO DRAWING P-040.00**

Replace Drawing P-040.00 with Drawing P-040.01, a copy of which is attached hereto.

**REFER TO DRAWING P-050.00**

Replace Drawing P-050.00 with Drawing P-050.01, a copy of which is attached hereto.

**REFER TO DRAWING P-060.00**

Replace Drawing P-060.00 with Drawing P-060.01, a copy of which is attached hereto.

**REFER TO DRAWING P-072.00**

Replace Drawing P-072.00 with Drawing P-072.01, a copy of which is attached hereto.

**REFER TO DRAWING P-080.00**

1. In the Interior and Exposed Piping Schedule, change the title "INTERIOR AND EXPOSED PIPING SCHEDULE" to read "PLUMBING PIPING SCHEDULE".
2. In Note 3, delete "OF THE STRUCTURES AND EQUIPMENT CONTRACT".
3. In Note 5, delete "OF THE PLUMBING CONTRACT".
4. In the Note 5, delete "OF THE STRUCTURES AND EQUIPMENT CONTRACT".

**REFER TO DRAWING P-201.00**

Replace Drawing P-201.00 with Drawing P-201.01, a copy of which is attached hereto.

**REFER TO DRAWING P-202.00**

Replace Drawing P-202.00 with Drawing P-202.01, a copy of which is attached hereto.

**REFER TO DRAWING P-210.00**

Replace Drawing P-210.00 with Drawing P-210.01, a copy of which is attached hereto.

**REFER TO DRAWING P-211.00**

Replace Drawing P-211.00 with Drawing P-211.01, a copy of which is attached hereto.

**REFER TO DRAWING P-220.00**

Replace Drawing P-212.00 with Drawing P-212.01, a copy of which is attached hereto.

**REFER TO DRAWING P-221.00**

Replace Drawing P-221.00 with Drawing P-221.01, a copy of which is attached hereto.

**REFER TO DRAWING P-230.00**

Replace Drawing P-230.00 with Drawing P-230.01, a copy of which is attached hereto.

**REFER TO DRAWING P-231.00**

Replace Drawing P-231.00 with Drawing P-231.01, a copy of which is attached hereto.

**REFER TO DRAWING P-232.00**

Replace Drawing P-232.00 with Drawing P-232.01, a copy of which is attached hereto.

**REFER TO DRAWING P-240.00**

Replace Drawing P-240.00 with Drawing P-240.01, a copy of which is attached hereto.

**REFER TO DRAWING P-241.00**

Replace Drawing P-241.00 with Drawing -241.01, a copy of which is attached hereto.

**REFER TO DRAWING P-250.00**

Replace Drawing P-250.00 with Drawing P-250.01, a copy of which is attached hereto.

**REFER TO DRAWING P-271.00**

Replace Drawing P-271.00 with Drawing P-271.01, a copy of which is attached hereto.

**REFER TO DRAWING P-280.00**

Revise note "PLUMBING CONTRACT NO. 2" to read "PLUMBING SYSTEMS".

**REFER TO DRAWING E-001.00**

Replace Drawing E-001.00 with Drawing E-001.01, a copy of which is attached hereto.

**REFER TO DRAWING E-101.00**

Replace Drawing E-101.00 with Drawing E-101.01, a copy of which is attached hereto.

**REFER TO DRAWING E-102.00**

1. Revise generator size "750KW" to read "900KW".
2. Revise circuit breaker frame and trip size for the fire pump controller to read 800AF/600AT".
3. Revise circuit breaker frame and trip size for the switchgear to read "1600AF/1400AT".
4. Revise circuit breaker frame and trip size the load bank to read "800AF/700AT".

**REFER TO DRAWING E-103.00**

1. Revise Supply Air Fan F-SAF-07 from "30HP" to read "25HP".
2. Revise circuit breaker at Node 2C from "100A" to "70A".
3. Revise circuit breaker at Node 3A from "70A" to "125A".
4. Revise Lighting Transformer F-LTX-2A from "45KVA" to read "75 KVA" and the ground wire from "1#6G" to read "1#2g".
5. Revise Exhaust Air Fan F-EAF-14" at Node 3E with a Size 1, 15A spare circuit breaker.
6. Revise Lighting Transformer F-LTX-04 ground wire from "1#6G" to read "1#4G".
7. Revise Exhaust Air Fan F-EAF-07 from "30HP" to read "25HP".
8. Revise circuit breaker at Node 7B from "100A" to read "70A".

**REFER TO DRAWING E-104.00**

1. Revise Lighting Transformer F-LTX-2B from "45KVA" to read "75 KVA" and the ground wire from "1#6G" to read "1#2G".
2. Revise Lighting Transformer F-LTX-03 ground wire from "1#6G" to read "1#4G".
3. Revise circuit breaker at Node 12A from "70A" to read "125A".

4. Add note to F-PSP-01 tag to read as follows:

“(VIA F-FCP-02) SEE NOTE 2”

5. Add note to F-FACP-01 tag to read as follows:

“(VIA F-FCP-02) SEE NOTE 2”

6. Revise Note 1 to read as follows:

“FOR GROUNDING CONNECTION REFER TO DRAWING E-311.”

7. Add Note 2 as follows:

“SEE DRAWING E-508 FOR FCP CONNECTION TO THE FA SYSTEM.”

8. Add circuit breaker size at node 11D to read “30A”.

**REFER TO DRAWING E-105.00**

Replace Drawing E-105.00 with Drawing E-105.01, a copy of which is attached hereto.

**REFER TO DRAWING E-106.00**

Replace Drawing E-106.00 with Drawing E-106.01, a copy of which is attached hereto.

**REFER TO DRAWING E-107.00**

Replace Drawing E-107.00 with Drawing E-107.01, a copy of which is attached hereto.

**REFER TO DRAWING E-108.00**

1. Remove horsepower from Bridge Crane tag.
2. Revise Bridge Crane F-OBC-01 disconnect from “30A” to read “60A”.
3. Revise circuit breaker at Node 3C from “30A” to read “50A”.

**REFER TO DRAWING E-109.00**

1. Revise Water Booster Pump F-DWP-1A and F-DWP-1B from “2HP” to read “1.5HP”.
2. Revise Note 1 to read as follows:

“FOR GROUNDING CONNECTION REFER TO DRAWING –E-311.”
3. Add control wiring for “F-PLC-01” to “F-MCC-03”.
4. Add Lighting Panel “D-LPB-2D1” with wiring tag 3M25B. Panelboard is tapped from lighting transformer “F-LTX-2D”.
5. Revise Lighting Transformer F-LTX-2D ground wire from “1#6G” to read “1#2G”.
6. Add Dry Sprinkler System Air Compressor “F-AIC-02” to Motor Control Center “F-MCC-03”. F-AIC-02 is 2HP has a control Panel, 30A disconnect, 15a circuit breaker in “F-MCC-03” and wire callout of 3M36.



7. Revise circuit breaker at Node 8D from "15A" to read "20A".

**REFER TO DRAWING E-110.00**

Replace Drawing E-110.00 with Drawing E-110.01, a copy of which is attached hereto.

**REFER TO DRAWING E-111.00**

Replace Drawing E-111.00 with Drawing E-111.01, a copy of which is attached hereto.

**REFER TO DRAWING E-112.00**

Replace Drawing E-112.00 with Drawing E-112.01, a copy of which is attached hereto.

**REFER TO DRAWING E-113.00**

Replace Drawing E-113.00 with Drawing E-113.01, a copy of which is attached hereto.

**REFER TO DRAWING E-114.00**

Replace Drawing E-114.00 with Drawing E-114.01, a copy of which is attached hereto.

**REFER TO DRAWING E-115.00**

Replace Drawing E-115.00 with Drawing E-115.01, a copy of which is attached hereto.

**REFER TO DRAWING E-121.00**

Replace Drawing E-121.00 with Drawing E-121.01, a copy of which is attached hereto.

**REFER TO DRAWING E-122.00**

Replace Drawing E-122.00 with Drawing E-122.01, a copy of which is attached hereto.

**REFER TO DRAWING E-201.00**

Replace Drawing E-201.00 with Drawing E-201.01, a copy of which is attached hereto.

**REFER TO DRAWING E-204.00**

Replace Drawing E-204.00 with Drawing E-204.01, a copy of which is attached hereto.

**REFER TO DRAWING E-205.00**

Replace Drawing E-205.00 with Drawing E-205.01, a copy of which is attached hereto.

**REFER TO DRAWING E-301.00**

Replace Drawing E-301.00 with Drawing E-301.01, a copy of which is attached hereto.

**REFER TO DRAWING E-302.00**

Replace Drawing E-302.00 with Drawing E-302.01, a copy of which is attached hereto.

**REFER TO DRAWING E-304.00**

Replace Drawing E-304.00 with Drawing E-304.01, a copy of which is attached hereto.

**REFER TO DRAWING E-305.00**

Replace Drawing E-305.00 with Drawing E-305.01, a copy of which is attached hereto.

**REFER TO DRAWING E-306.00**

Replace Drawing E-306.00 with Drawing E-306.01, a copy of which is attached hereto.

**REFER TO DRAWING E-307.00**

Replace Drawing E-307.00 with Drawing E-307.01, a copy of which is attached hereto.

**REFER TO DRAWING E-308.00**

Add fire smoke damper power supply junction box above the Supervisor's Office and connect to Circuit 2D-38.

**REFER TO DRAWING E-309.00**

Replace Drawing E-309.00 with Drawing E-309.01, a copy of which is attached hereto.

**REFER TO DRAWING E-311.00**

Replace Drawing E-311.00 with Drawing E-311.01, a copy of which is attached hereto.

**REFER TO DRAWING E-314.00**

Replace Drawing E-314.00 with Drawing E-314.01, a copy of which is attached hereto.

**REFER TO DRAWING E-315.00**

Replace Drawing E-315.00 with Drawing E-315.01, a copy of which is attached hereto.

**REFER TO DRAWING E-316.00**

Replace Drawing E-316.00 with Drawing E-316.01, a copy of which is attached hereto.

**REFER TO DRAWING E-317.00**

Replace Drawing E-317.00 with Drawing E-317.01, a copy of which is attached hereto.

**REFER TO DRAWING E-319.00**

Replace Drawing E-319.00 with Drawing E-319.01, a copy of which is attached hereto.

**REFER TO DRAWING E-350.00**

Replace Drawing E-350.00 with Drawing E-350.01, a copy of which is attached hereto.

**REFER TO DRAWING E-351.00**

Replace Drawing E-351.00 with Drawing E-351.01, a copy of which is attached hereto.

**REFER TO DRAWING E-352.00**

Replace Drawing E-352.00 with Drawing E-352.01, a copy of which is attached hereto.

**REFER TO DRAWING E-353.00**

Replace Drawing E-353.00 with Drawing E-353.01, a copy of which is attached hereto.

**REFER TO DRAWING E-354.00**

Replace Drawing E-354.00 with Drawing E-354.01, a copy of which is attached hereto.

**REFER TO DRAWING E-355.00**

Replace Drawing E-355.00 with Drawing E-355.01, a copy of which is attached hereto.

**REFER TO DRAWING E-401.00**

Replace Drawing E-401.00 with Drawing E-401.01, a copy of which is attached hereto

**REFER TO DRAWING E-402.00**

Remove local override switch from Storage 4.

**REFER TO DRAWING E-403.00**

1. Remove light switch from Vestibule E.
2. Revise Vestibule E C1 light fixture tag from "LP2-17" to read "LP2-2".

**REFER TO DRAWING E-404.00**

Remove local override switch from Unassigned Storage.

**REFER TO DRAWING E-405.00**

1. Add occupancy sensor in Supervisor's Office.
2. Replace line voltage switch with local override switch in Supervisors Office.
3. Clarify circuit numbering in Vestibule C and Vestibule D.
4. Remove light switch at column lines 15 and C.

**REFER TO DRAWING E-406.00**

1. Clarify circuit numbering for occupancy sensors in Operations Room.
2. Remove 1 local override switch in Operations Room.

**REFER TO DRAWING E-408.00**

Replace Drawing E-408.00 with Drawing E-408.01, a copy of which is attached hereto.

**REFER TO DRAWING E-409.00**

Replace Drawing E-409.00 with Drawing E-409.01, a copy of which is attached hereto.

**REFER TO DRAWING E-411.00**

Replace Drawing E-411.00 with Drawing E-411.01, a copy of which is attached hereto.

**REFER TO DRAWING E-501.00**

Replace Drawing E-501.00 with Drawing E-501.01, a copy of which is attached hereto.

**REFER TO DRAWING E-503.00**

1. Remove smoke detector from Stair A.
2. Remove smoke detector from vestibule E.
3. Add 2 horns along Column Line 7 in the Maintenance Equipment Storage Area.

**REFER TO DRAWING E-505.00**

1. Add heat detector to Electrical Room 2.
2. Rename TCP panel in Electrical Room 2 to read "TCP-02".
3. Provide callout in Electrical Room 2 for F-MCC-01.
4. Provide Duct Detector FSD-RTU-02 in Vestibule C (above the ceiling).

**REFER TO DRAWING E-506.00**

Provide addressable relay near F-VES-01 along Column Line 17-F above the catwalk.

**REFER TO DRAWING E-507.00**

1. Remove note "FOR INTERMEDIATE LEVEL STAIR SEE PARTIAL PLAN BELOW" from Stair A and Stair B.
2. Show location of smoke hatch addressable relay. Realign note 3 tag to point to smoke hatch addressable relay (2 locations).

**REFER TO DRAWING E-508.00**

Replace Drawing E-508.00 with Drawing E-508.01, a copy of which is attached hereto.

**REFER TO DRAWING E-509.00**

1. Add Note A.1.k to read as follows:

'SEND AN ALARM TO GAS SAFETY SHUTOFF VALVE.'

2. Add Gas Safety Shutoff Valve to the Fire Alarm System Block Diagram.

**REFER TO DRAWING E-601.00**

1. Remove emergency lighting ups/battery cabinets from security room.
2. Remove 1 hardwired telephone device from security room.

**REFER TO DRAWING E-608.00**

1. Revise Foreman's office to read Supervisors office
2. Revise Fuel Post tag to read Fuel Port.
3. Add Note 7 callout to Stair B.
4. Add Note 7 to read as follows:

"HARDWIRED TELEPHONE DEVICES ARE DEDICATED TO THE FIRE ALARM SYSTEM."

**REFER TO DRAWING E-701.00**

1. Move the pull box near Column Lines 4 and B-C to the west side of the machine shop room.
2. Change the homerun from that pull box to 2"C-9#10, 6-F.O. MULTIMODE.

**REFER TO DRAWING E-709.00**

Replace Drawing E-709.00 with Drawing E-709.01, a copy of which is attached hereto.

**REFER TO DRAWING E-714.00**

Added Cameras C33 "Outbound Lane" and C34 "Inbound Lane" after C32 "Truck Exit" on the Riser Diagram.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT E – REVISIONS TO THE BID BOOKLET**

1. MWBE PROGRAM SUBCONTRACTOR UTILIZATION PLAN, page 5 of the Bid Booklet:

The following text is added to this page:

“The current Mayor’s Office of Contracts’ List of Services memo outlines the procurement categories for various subcontracted services. Services that are procured under “Standard Service” do not count toward either TSP or MBE participation goal requirements for this construction project.”

2. Delete Bid Schedule page 13-0 of the Bid Booklet and replace with revised Bid Schedule page 13-0-R, included with this Addendum.
3. Delete Contractor’s Bid Schedule pages 13-1, 13-2 and 13-3 of the Bid Booklet and replace with revised Contractor’s Bid Schedule pages 13-1-R, 13-2-R and 13-3-R included with this Addendum.

PROJECT ID: S216-399A

## BID SCHEDULE

**Submission:** Bidders are advised that the requirement to submit a Bid Schedule applies to the contract for which an "X" is indicated before the word "Yes". If required, the bidder must submit, with its bid, a completed Bid Schedule. Failure to provide a completed Bid Schedule may result in rejection of the bid as non-responsive.

      X       YES                      NO

### Instructions for Preparing Bid Schedule:

- (A) The following bid prices on the Bid Schedule are to be paid for the actual quantities of the item numbers in the completed work or structure, and they cover the cost of all work, labor, material, tools, plant and appliances of every description necessary to complete the entire work, as specified, and the removal of all debris, temporary work and appliances.
- (B) In preparing its Bid Schedule, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, and bonds.
- (C) The Agency may reject a bid if it contains unbalanced bid prices. An unbalanced bid is considered to be one containing lump sum or unit items which do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs, anticipated for the performance of the items in question.
- (D) The bidder shall refer to section 01270, Measurement and Payment for specific explanation of Bid Schedule Items, and Attachment C, Addendum 2 for revised Article 1.02 A) of Section 01270, Measurement and Payment.

**PLEASE BE SURE A LEGIBLE BID IS ENTERED FOR EACH ITEM.**  
**THE BIDDER SHALL INSERT THE TOTAL BID PRICE ON**  
**THE BID SCHEDULE ON PAGE 13-R OF THIS BID BOOKLET**

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
1	Structures and Equipment – <i>items a through m</i>				
a.	General Conditions (except for Temporary Heat, Security Guards and Trailer Office) – <i>see DDC General Conditions and the Addendum to the General Conditions</i>	--	Lump Sum	Not Applicable	\$ _____
	Temporary Heat	--	Lump Sum	Not Applicable	\$ _____
	Security Guards/Fire Guards on Site	--	Lump Sum	Not Applicable	\$ _____
	Trailer Office (monthly utility and service costs included)	36	Month(s)	Not Applicable	\$ _____
b.	Demolition	--	Lump Sum	Not Applicable	\$ _____
c.	Concrete	--	Lump Sum	Not Applicable	\$ _____
d.	Masonry	--	Lump Sum	Not Applicable	\$ _____
e.	Metals	--	Lump Sum	Not Applicable	\$ _____
f.	Woods and Plastics	--	Lump Sum	Not Applicable	\$ _____
g.	Thermal and Moisture Protection	--	Lump Sum	Not Applicable	\$ _____
h.	Doors and Windows	--	Lump Sum	Not Applicable	\$ _____
i.	Finishes	--	Lump Sum	Not Applicable	\$ _____
j.	Specialties	--	Lump Sum	Not Applicable	\$ _____
k.	Furnishings	--	Lump Sum	Not Applicable	\$ _____
l.	Equipment	--	Lump Sum	Not Applicable	\$ _____
m.	Work Not Included in Other Bid Item Categories	--	Lump Sum	Not Applicable	\$ _____
	SUBTOTAL: Structures and Equipment – <i>items a through m</i>	--	Lump Sum	Not Applicable	\$ _____

Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
2	Concrete Ramp – Option 1 OR Mechanically Stabilized Earth Ramp – Option 2	<u>check</u> selection	Lump Sum	Not Applicable	\$ _____
3	Site Work and Landscaping	--	Lump Sum	Not Applicable	\$ _____
4	Gantry Cranes and Container Transport System	--	Lump Sum	Not Applicable	\$ _____
5	3-Year Service Agreement for Container Gantry Cranes	--	Lump Sum	Not Applicable	\$ _____
6	Heating, Ventilation and Air Conditioning	--	Lump Sum	Not Applicable	\$ _____
7	Plumbing and Fire Protection	--	Lump Sum	Not Applicable	\$ _____
8	Electrical Work	--	Lump Sum	Not Applicable	\$ _____
9	NOT USED	--	--	--	--
10	NOT USED	--	--	--	--
11	Hazardous Material Remediation	--	Allowance	Not Applicable	\$75,000
12	Con Edison Electrical Service Work	--	Allowance	Not Applicable	\$150,000
13	Dredging	5,500	CY	\$ _____ per CY	\$ _____
14	Steel Pipe Piles, 16-inch dia.	3,100	LF	\$ _____ per LF	\$ _____
15	Steel Pipe Piles, 20-inch dia. ---OR--- 150-Ton Composite Tapered Piles	103,400 --or-- 669	LF --or-- EA	\$ _____ per LF --or-- \$ _____ each	\$ _____
16	Steel Pipe Piles, 36-inch dia.:  For Concrete Ramp – Option 1 ---OR--- For Mechanically Stabilized Earth Ramp – Option 2 <i>Option selection must match ramp option selected in Bid Item 2</i>	5,800 --or-- 4,000	LF	\$ _____ per LF --or-- \$ _____ per LF	\$ _____



Southwest Brooklyn Marine Transfer Station  
1824 Shore Parkway  
Brooklyn, NY 11214

CONTRACTOR'S BID SCHEDULE  
PROJECT ID: S216-399A  
Client Agency: DSNY

BIDDERS NAME: \_\_\_\_\_

Bid Item	Description of Work	Estimated Quantity	Units	Unit Price	Total Bid Price
17	Pile Driving Analyzer Load Tests - Steel Pipe Piles	50	EA	\$ _____ each	\$ _____
18	Compression Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$ _____ each	\$ _____
19	Compression Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$ _____ each	\$ _____
20	Lateral Pile Load Tests - Steel Pipe Piles, 20-inch dia. or Composite Tapered Piles	5	EA	\$ _____ each	\$ _____
21	Lateral Pile Load Tests - Steel Pipe Piles, 36-inch dia.	2	EA	\$ _____ each	\$ _____
22	Marine Timber Piles	850	LF	\$ _____ per LF	\$ _____
23	Concrete Spall Repair - Shallow	100	SF	\$ _____ per SF	\$ _____
24	Concrete Spall Repair - Deep	100	CF	\$ _____ per CF	\$ _____
25	Concrete Crack Repair - Type A	500	LF	\$ _____ per LF	\$ _____
26	Concrete Crack Repair - Type B	200	LF	\$ _____ per LF	\$ _____
27	Concrete Crack Repair - Type C	100	LF	\$ _____ per LF	\$ _____
28	Additional Earth Excavation	500	CY	\$ _____ per CY	\$ _____
29	Additional Select Fill	100	CY	\$ _____ per CY	\$ _____
30	Additional Common Fill	100	CY	\$ _____ per CY	\$ _____
				<b>TOTAL BID ITEMS 1 through 30</b>	\$ _____

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT F – REVISIONS TO VOLUME 2**

**Volume 2:** Volume 2 of the Bid and Contract Documents is amended to include the Notice to Bidders/Proposers (page 1 of 2 to this Addendum).

**Standard Construction Contract (Sept. 2008):** The Standard Construction Contract dated September 2008 is amended to include the provision entitled Whistleblower Protection Expansion Act Rider (page 2 of 2 to this Addendum).

## **NOTICE TO BIDDERS, PROPOSERS, CONTRACTORS, AND RENEWAL CONTRACTORS**

This contract includes a provision concerning the protection of employees for whistleblowing activity, pursuant to New York City Local Law Nos. 30-2012 and 33-2012, effective October 18, 2012 and September 18, 2012, respectively. The provisions apply to contracts with a value in excess of \$100,000.

Local Law No. 33-2012, the Whistleblower Protection Expansion Act ("WPEA"), prohibits a contractor or its subcontractor from taking an adverse personnel action against an employee or officer for whistleblower activity in connection with a City contract; requires that certain City contracts include a provision to that effect; and provides that a contractor or subcontractor may be subject to penalties and injunctive relief if a court finds that it retaliated in violation of the WPEA. The WPEA is codified at Section 12-113 of the New York City Administrative Code.

Local Law No. 30-2012 requires a contractor to prominently post information explaining how its employees can report allegations of fraud, false claims, criminality, or corruption in connection with a City contract to City officials and the rights and remedies afforded to employees for whistleblowing activity. Local Law No. 30-2012 is codified at Section 6-132 of the New York City Administrative Code.

## WHISTLEBLOWER PROTECTION EXPANSION ACT RIDER

1. In accordance with Local Law Nos. 30-2012 and 33-2012, codified at sections 6-132 and 12-113 of the New York City Administrative Code, respectively,
  - (a) Contractor shall not take an adverse personnel action with respect to an officer or employee in retaliation for such officer or employee making a report of information concerning conduct which such officer or employee knows or reasonably believes to involve corruption, criminal activity, conflict of interest, gross mismanagement or abuse of authority by any officer or employee relating to this Contract to (i) the Commissioner of the Department of Investigation, (ii) a member of the New York City Council, the Public Advocate, or the Comptroller, or (iii) the City Chief Procurement Officer, ACCO, Agency head, or Commissioner.
  - (b) If any of Contractor's officers or employees believes that he or she has been the subject of an adverse personnel action in violation of subparagraph (a) of paragraph 1 of this rider, he or she shall be entitled to bring a cause of action against Contractor to recover all relief necessary to make him or her whole. Such relief may include but is not limited to: (i) an injunction to restrain continued retaliation, (ii) reinstatement to the position such employee would have had but for the retaliation or to an equivalent position, (iii) reinstatement of full fringe benefits and seniority rights, (iv) payment of two times back pay, plus interest, and (v) compensation for any special damages sustained as a result of the retaliation, including litigation costs and reasonable attorney's fees.
  - (c) Contractor shall post a notice provided by the City in a prominent and accessible place on any site where work pursuant to the Contract is performed that contains information about:
    - (i) how its employees can report to the New York City Department of Investigation allegations of fraud, false claims, criminality or corruption arising out of or in connection with the Contract; and
    - (ii) the rights and remedies afforded to its employees under New York City Administrative Code sections 7-805 (the New York City False Claims Act) and 12-113 (the Whistleblower Protection Expansion Act) for lawful acts taken in connection with the reporting of allegations of fraud, false claims, criminality or corruption in connection with the Contract.
  - (d) For the purposes of this rider, "adverse personnel action" includes dismissal, demotion, suspension, disciplinary action, negative performance evaluation, any action resulting in loss of staff, office space, equipment or other benefit, failure to appoint, failure to promote, or any transfer or assignment or failure to transfer or assign against the wishes of the affected officer or employee.
  - (e) This rider is applicable to all of Contractor's subcontractors having subcontracts with a value in excess of \$100,000; accordingly, Contractor shall include this rider in all subcontracts with a value in excess of \$100,000.
2. Paragraph 1 is not applicable to this Contract if it is valued at \$100,000 or less. Subparagraphs (a), (b), (d), and (e) of paragraph 1 are not applicable to this Contract if it was solicited pursuant to a finding of an emergency. Subparagraph (c) of paragraph 1 is neither applicable to this Contract if it was solicited prior to October 18, 2012 nor if it is a renewal of a contract executed prior to October 18, 2012.

# ENCLOSURES

**Section 02371**  
**DUST, SOIL EROSION AND SEDIMENTATION CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to assure adequate environmental protection including implementation of all erosion and sediment control measures and maintenance of storage areas as directed by the Commissioner.
- B. The Contractor shall provide an Erosion and Sediment Control Plan (ESCP) that addresses measures to prevent migration of contaminated storm water and sediment and to prevent erosion of features of the Work.
- C. The Contractor shall prevent discharge of sediment or erosion to watercourses, public streets or private property from dewatering operations. The Contractor shall provide methods to prevent demolition and construction debris from contaminating storm water runoff.
- D. The Contractor shall comply with all applicable regulatory requirements and all Federal, State, or local laws, codes, ordinances and regulations that govern the control of sediment, erosion and storm water during excavation.
- E. The Contractor shall provide Best Management Practices (BMP) including but not limited to: reinforced silt fences, catch basins sediment traps, stabilized construction entrances, turbidity curtains or other approved means as a temporary structural practice to minimize erosion and sediment runoff.
- F. The Contractor shall provide and implement a Storm Water Pollution Prevention Plan (SWPPP) prepared in accordance with the current New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activities. The SWPPP shall be prepared in accordance with the approved SWPPP.
- G. The Contractor shall control dust and noise caused by operation and movement of vehicles and equipment in accordance with the latest NYC DEP, and OSHA standards, and all other applicable Federal, State and local regulations.
- H. The Contractor shall comply with the requirements given in the NYS DEC approved Stormwater Pollution Prevention Plan for the project. Any changes intended to be made to the SWPPP recommendations should be submitted in conformance with Article 1.07.

## 1.02 RELATED SPECIFICATIONS

- A. Section 02240 - Dewatering

## 1.03 REFERENCES

- A. Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. ASTM D 3786 - Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
2. ASTM D 4354 - Sampling of Geosynthetics for Testing
3. ASTM D 4355 - Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
4. ASTM D 4439 - Standard Terminology for Geotextiles
5. ASTM D 4491 - Water Permeability of Geotextiles by Permittivity
6. ASTM D 4533 - Trapezoid Tearing Strength of Geotextiles
7. ASTM D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles
8. ASTM D 4751 - Method for Determining Apparent Opening Size of a Geotextile
9. ASTM D 4759 - Method for Determining the Specification Conformance of Geosynthetics
10. ASTM D 4873 - Method for Identification, Storage, and Handling of Geotextiles
11. ASTM D 1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method
12. ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Hammer and 18-in. Drop
13. ASTM D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

14. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
15. Most recent version of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity,
16. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section 650 (Subpart p - Excavations)
17. Most recent version of New York State DEC General Discharge Permit
18. Most recent version of New York State Stormwater Management Design Manual
19. Most recent version of New York State Standards and Specifications for Erosion and Sediment Controls
20. Most recent version of SWPPP approved by the NYS DEC.

#### 1.04 DEFINITIONS

- A. Primary System: Consists of one or more of the following components: reinforced silt fence, sediment traps, stabilized construction entrances, sumps, pumps, piping, or other means determined by the Contract Documents. Components shall be of sufficient size to handle the temporary sediment, storm water and erosion control as required by the Contract Documents.
- B. Backup Components: Components such as backup pumps, piping and other components which shall be sufficiently sized and prepared to incorporate them into the system if there is potential for the failure of a primary system component (i.e., if generators are part of the primary system, have generators readily available in the event of a power failure).
- C. Best Management Practices: Physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollution of water, and have been approved by the New York City Department of Protection or other accepted certified agency.
- D. Commencement of Construction: The initial removal and disturbance of soils and vegetation associated with clearing, grading, excavation, fabrication, or installation activities.
- E. Erosion: The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as geological creep, detachment, movement of soil or rock fragments by water, wind, ice, or gravity.



- F. Erosion/Sediment Control: Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave the site.
- G. Final Stabilization: All soil-disturbing activities at the site have been completed and uniform, perennial vegetative cover with the density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.
- H. Receiving Waters: Bodies of water or surface water systems receiving water from upstream manmade (or natural) streams.
- I. Sediment: Fragmented material that originates from weathering and erosion of rocks and unsolicited deposits, and is transported by, suspended in, or deposited in water.

#### 1.05 SYSTEM DESCRIPTION

- A. Reinforced Silt Fences: The Contractor shall provide reinforced silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (i.e. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations required and shown on the approved working drawings. Final removal of silt fence barriers shall be upon approval by the Commissioner.
- B. Sediment Traps: Sediment trap basins shall be provided around the catch basins to intercept sediment laden runoff and retain the sediment. Proposed locations of sediment traps are shown in the SWPPP. In addition, the Contractor shall provide sediment traps around any other temporary stormwater outlets from the construction site. Upon approval by the Commissioner, the sediment trap shall be removed and the area stabilized when the constructed drainage area has been properly stabilized.
- C. Stabilized Construction Entrances: The Contractor shall provide a stabilized pad of aggregates underlain with geotextile at all construction vehicle ingress and egress locations to eliminate tracking of sediments onto public rights of way. Representative locations of the stabilized constructions are shown in the SWPPP.

#### 1.06 SUBMITTALS

- A. Provide all submittals in accordance with Section 4 of the General Conditions and Section 01330 - Shop Drawings.

- B. Working Drawings: The Contractor shall submit to the Commissioner for approval Working Drawings and other documentation required to show conformance with the requirements specified and shown on the Contract Drawings.
1. Working drawings shall show details of the Sediment and Storm Water Control System. The working drawings shall include, at a minimum, the following:
    - a. Plan locations of all components of the Sediment/Storm water Control System.
    - b. Detail of silt fence, sediment traps, stabilized construction entrances, and other installations and other applicable BMPs.
  2. The Contractor shall submit manufacturer's descriptive literature and installation instructions for stockpile liner and cover material.
- C. Erosion and Sediment Control Plan (ESCP): The Contractor shall develop and submit for approval, 30 days following Notice to Proceed, an ESCP, in accordance with the SWPPP. The ESCP shall address schedules and measures that will be taken to prevent migration of contaminated storm water/sediment, and to prevent erosion of features of the Work. The ESCP shall include the following at a minimum:
1. Stormwater runoff.
  2. Provisions for silt fences, sediment traps, stabilized construction entrances and other measures to limit migration of sediments.
  3. Diversion of storm water: The Contractor shall include provisions for controlling storm water runoff in and around excavation areas.
  4. Soil Storage Area: All details of temporary soil storage to be implemented as specified in this section in accordance with specification section 02225 Impacted Soil Handling and 02106 Ex-Situ Soil Sampling Testing and Lab Analysis.
  5. Soil Stabilization practices: All details of soil stabilization practices to be implemented, as specified in this section.
  6. Provisions for all other applicable Best Management Practices.
- D. The Contractor shall develop and submit for approval a Storm Water Pollution Prevention Plan (SWPPP) for all work areas prepared pursuant to New York State Department of Environmental Conservation (NYSDEC) and New York Soil and Water Conservation Society (SWCS) requirements. The SWPPP shall be submitted prior to the initiation of construction activities. In addition to the details included in

the NYSDEC approved SWPPP, the contractor's SWPPP shall include the following at a minimum:

1. Provide background information about the scope of the project, including the location, type of size of project.
2. Provide a site map for the project, including a general location map. The site map should show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s), wetlands and drainage patterns that could be affected by the construction activity; existing and final slopes; locations of off-site material, waste, borrow or equipment storage areas; and location (s) of the storm water discharge(s);
3. Provide a description of the soil(s) present at the site;
4. Provide a construction-phasing plan describing the intended sequence of construction activities, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance. Consistent with the New York Guidelines for Urban Erosion and Sediment Control, there shall not be more than five (5) acres of disturbed soil at any one time without prior written approval from the Department;
5. Provide a description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a pollutant source in the storm water discharges;
6. Provide a description of construction and waste materials expected to be stored on-site with updates as appropriate, and a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention response;
7. Describe the temporary and permanent structural and vegetative measures to be used for soil stabilization, runoff control and sediment control for each stage of the project from initial land clearing and grubbing to project closeout;
8. Identify and show on a site map the specific location(s), size(s), and length(s) of each erosion and sediment control practice;
9. Provide the dimensions, material specifications, and installation details for all erosion and sediment control practices, including the siting and sizing of any temporary sediment basins;
10. Identify temporary practices that will be converted to permanent control measures;

11. Provide an implementation schedule for staging temporary erosion and sediment control practices, including the timing of initial placement and the placement and the duration that each practice should remain in place;
  12. Provide a maintenance schedule to ensure continuous and effective operation of the erosion and sediment control practices;
  13. Provide an inspection program which shall comply with the requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity.
  14. Provide the name(s) of the receiving water(s);
  15. Provide a delineation of SWPPP implementation responsibilities for each part of the site;
  16. Provide a description of structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable; and
  17. Provide any existing data that describes the storm water runoff characteristics at the site.
  18. Concrete Truck Washing: Contractor shall prevent concrete wash water from entering waterways, storm drains and groundwater. All concrete waste and wash water shall be returned with each concrete truck for disposal at the concrete batch plant. Truck wash and debris, if any, disposed in the site shall have a proper containment place included in the SWPPP and approved by the Commissioner.
  19. Construction Sequence Scheduling Plan: The Contractor shall provide a schedule to handle all work associated with operations included in preconstruction, construction and post-construction.
  20. Temporary and Permanent Soil Stabilization Plan: A temporary and permanent soil stabilization plan in accordance with the standards referenced in Article 1.03.
- E. Following commencement of construction, the Contractor shall submit site inspection reports. Qualified Inspector shall have the credentials as required by Part III of the SPDES General Permit for Stormwater Discharges from Construction Activities. During each inspection, the qualified professional shall record the following information:
1. On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2. Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;
  3. Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;
  4. Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of the sediment storage volume (for example, 10 percent, 20 percent, 50 percent);
  5. Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and
  6. All deficiencies that are identified with the implementation of the SWPPP.
  7. Inspection reports shall be maintained in a logbook at the site with the SWPPP. Contractor shall submit inspect and prepare reports consistent with requirement of the SWPPP, the current NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities, and the current NYSDEC SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems. A sample inspection report is enclosed in the SWPPP. A monthly summary of the site inspection activities shall be provided to the Commissioner.
- F. Contractor's Certification Statement: A Contractor's signed "Certification Statement" as required by Part III of the NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity shall be completed prior to the commencement of construction activity and incorporated in the on-site copy of the SWPPP. The original signed copy of the certification statement shall be kept in the on-site copy of the SWPPP. The certification page shall also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the trained individual(s) responsible for SWPPP implementation; the name, address and telephone number of the firm; the address of the site; and the date the certification statement is signed.

## 1.07 QUALITY ASSURANCE

- A. The Contractor shall obtain all necessary permits and be responsible for implementing the terms and requirements of these permits as needed and for payment of all fees.
- B. Handle all material in compliance with applicable requirements of OSHA and other governing authorities having jurisdiction.
- C. Codes and Standards: State and City of New York laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.
- D. The Contractor and subcontractors shall identify at least one person from their company that will be responsible for implementation of the SWPPP pursuant to the requirements in Part III of the NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity. This person shall be known as the *trained contractor*. At least one trained contractor shall be on site on a daily basis when soil disturbance activities are being performed.
- E. Stabilization. The contractor shall initiate stabilization measures as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased.
- F. Maintenance. The Contractor shall maintain the erosion and sedimentation control system to ensure the efficacy of the system. Comply with the maintenance requirements of this Specification Section and with the NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity
- G. The SWPPP shall be kept current. If there is a significant change in construction which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP, the SWPPP shall be updated to reflect those required changes. The SWPPP shall also be amended if it proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified in the SWPPP or achieving the general objectives of controlling pollutants in storm water discharges from permitted construction activity. Additionally, the SWPPP shall be amended to identify any new subcontractor.
- H. Monitoring
  - 1. During the course of construction, monitoring of discharge(s) from the permitted construction activity may be required. Notification of the basis for such monitoring, the parameters and frequency at which monitoring shall occur and the associated reporting requirements will be provided.

2. General Permit 02-01 prohibits the discharge of materials other than storm water and all discharges which contain a hazardous substance in excess of reportable quantities established by 40 Code of Federal Regulations (CFR) 117.3 of 40 CFR 302.4, unless a separate NPDES permit has been issued to regulate those discharges. Permits for storm water discharges associated with construction activity must meet all applicable provisions of Sections 301 and 402 of the Clean Water Act.
3. The Contractor shall implement the SWPPP and monitoring program and retain all records for a period of at least three (3) years after construction is completed.

#### 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Soil Stabilization: The stabilization practices to be implemented shall include one or a combination of the following: temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees and preservation of mature vegetation. Stabilization practices shall be as approved by the Commissioner. The Contractor shall record the dates when the major grading activities occur (i.e., clearing and grubbing, excavation, embankment and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in Paragraphs 1.08A.1 and 1.08A.2, stabilization practices shall be initiated as soon as practicable, but no more than 14 days after construction activities have temporarily or permanently ceased.
  1. Unsuitable Conditions: Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.
  2. Temporary Inactivity Less than 21 Days: Where construction activity will resume on a portion of the site within 21 days after it temporarily ceases, no stabilization practices will be required.
- B. Erosion and Sediment Control: Sediment and storm water control components shall be operational at all times during the Work, specifically during excavation, backfilling and restoration, and decontamination operations. The sediment and storm water control system shall be capable of handling storm water during construction. Damage to excavation slopes and the migration of contaminated soil to downstream areas resulting from storm events shall be repaired or remediated by the Contractor, at the Contractor's expense.
- C. Storm water: At no time shall the Contractor allow storm water from site operations, or water from decontamination operations to migrate off of, or percolate into, the ground below the decontamination area, so as to impact non-contaminated areas. The Commissioner will monitor any overflow or leakage that occurs, and

may, at his discretion, require the Contractor to perform soil sampling within non-contaminated areas affected by such overflow. Any soils that have been contaminated by such overflow shall be removed, treated and disposed of by the Contractor. All sampling, analyses, treatment and disposal of soils required as a result of overflow on formerly non-contaminated soil shall be performed by the Contractor at no additional cost to the City of New York.

- D. Disposal of Water: Water collected from decontamination areas, dewatering operations shall be handled in accordance with Section 02240 - Dewatering.

#### 1.09 PROJECT CONDITIONS

- A. Existing Work: All silt fences, sediment traps, construction entrances, sumps, pumps, piping, and other sediment/storm water controls shall be installed such that other aspects of the Work are not adversely impacted or endangered. The sediment traps should be installed avoiding any interference with the construction traffic. All installations shall be subject to the approval of the Commissioner.
- B. Dust Control: The Contractor shall be responsible for controlling visible dust caused by Work operations and the moving of vehicles and equipment. Dust control shall be implemented when soils are exposed, before, during and after Work activity ceases. Dust control will also be required on the weekends. The Contractor shall apply water or use other methods, subject to the Commissioner's approval, when visible dust is present on-site, in accordance with the Health and Safety Plan. The use of chemicals, including calcium chloride for dust control, will not be permitted.
1. All excavation, loading and transport of materials shall minimize the formation of dust and shall conform to 02316 Excavation. To prevent dust generation, application of water to roadways and active work areas shall be utilized as required. The Contractor's operations shall include air monitoring and dust minimization measures, consistent with the Health and Safety Plan (HASP) required by the Information for Bidders' Section 41 - DDC Safety Requirements.
- C. Silt and Sediment Disposal: All silt and sediment which accumulates behind silt fences or other erosion control structures shall be removed and disposed of off-site in accordance with all applicable Federal, State and local regulations.

#### 1.10 STORAGE, HANDLING AND REMOVAL

- A. Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.
- B. The Contractor shall store, handle, and remove material and equipment consistent with requirements of the SWPPP and NYSDEC SPDES General Permit for



Stormwater Discharges from Construction Activities (Permit No. GP-0-08-001) or latest version.

- C. Removal of all waste shall be in accordance with Detailed Specification 01733-Construction Waste Management.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. Components for Reinforced Silt Fences

1. **Filter Fabric:** Geotextile fabric that consists of a woven pervious sheet of plastic yarn as defined by ASTM D 123-90 and ASTM D 4439. The geotextile fabric shall be one that is recommended for such use by the manufacturer. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide and shall contain stabilizers and inhibitors added to the base plastic, if necessary, to make the filament resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextile fabric shall be finished to prevent the outer fiber from pulling away.
2. **Seams:** The seams of the geotextile fabric shall be sewn with thread of material compatible with the fabric given above for geotextile yarn. Factory seams shall be tested in accordance with Method ASTM D1683-90, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength of the geotextile fabric in any direction.

Filter Fabric Physical Requirements		
Physical Property	Test Procedure	Acceptable Values
Weight	ASTM D3776	5.6 oz/sy
Thickness	ASTM D1777	24 mils
Grab Tensile Strength Elongation (%)	ASTM D 4632	10 lbs./ %
Burst Strength	ASTM D3786	500+ psi
Trapezoid Tear Strength	ASTM D4533	115 x 90 lb.

3. **Silt Fence Stakes and Posts:** Provide wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction,

shall have a minimum mass of 1.33 pounds per linear foot and a minimum length of 5 feet.

4. Reinforcement: Provide wire fence for reinforcement, minimum 14 gauge construction with a maximum 6-inch mesh opening or as approved.

**B. Components for Stabilized Construction Entrances**

1. Aggregates: The aggregates to be used shall be a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.
2. The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties	Test Procedure	Acceptable Values
Grab Tensile Strength (lbs)	ASTM D1682	220
Elongation at Failure(%)	ASTM D1682	50
Mullen Burst (psi)	ASTM D3786	430
Puncture Strength (lbs)	ASTM D751 modified	125
Slurry Flow Rate (gal/min/sf)	-	0.3
Equivalent Opening Size	Us Std Sieve CW-02215	40-80
Aggregate Depth	-	10
Ultraviolet Radiation Stability (%)	ASTM G-26	90

- C. Mill Certificate: A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate signed by an authorized official from the company manufacturing the filter fabric.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Silt Fences: Silt fences shall extend a minimum of 16 inches to a maximum of 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6-inch

overlap, and securely sealed. A trench shall be excavated, approximately 4 inches wide and 4 inches deep, on the up slope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences may only be removed upon approval by the Commissioner.

- B. **Sediment Traps:** The volume of sediment storage of the traps shall be 3600 cubic feet per acre of contributory drainage. All excavations for the trap shall be carried in such a way that the erosion and water pollution shall be minimal. All cut slopes of the basin shall be 1:1 or flatter.
- C. **Stabilized Construction Entrances:** Stabilized Construction Entrances shall have a minimum thickness of six inches. The width shall be at least 12 foot but not less than the full width of points where ingress or egress occurs. However, the width shall be a minimum of 24-foot if there is only one access to the site. Stabilized Construction Entrances shall be at least 50 feet long. Geotextile shall be placed over the entire area to be covered with aggregate. Piping of surface water under entrance shall be provided if required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.
- D. **Turbidity Curtain** is a flexible impenetrable barrier used to trap sediments in water bodies. This curtain is weighted at the bottom to achieve closure while supported at the top through a floatation system. Turbidity curtain shall be used wherever applicable to prevent the migration of silt from the work site into the East River.
- E. **Maintenance:** The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.
  - 1. **Silt Fence Maintenance:** Silt fences shall be inspected in accordance with Article 3.02 of this Section. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed and disposed of off-site when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence shall be shaped to an acceptable grade and stabilized.
  - 2. **Sediment Trap maintenance:** Sediment traps shall be inspected after each rain and repairs made as needed. Sediments from sediment traps shall be removed and the trap restored to its original dimensions when the sediment has accumulated to half the design depth of the trap. Removed sediment shall be

deposited in a suitable area and stabilized in such a manner that it will not erode.

3. Stabilized Construction Entrance maintenance: The entrances shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. Periodic top dressing with additional aggregate shall be done as needed. All sediment spilled, dropped or washed onto the public area must be removed immediately. When necessary, wheels must be cleaned to remove sediment prior to entrance onto public right-of-ways. All sediment shall be prevented from entering storm drains, ditches or watercourses. Periodic inspection and needed maintenance shall be provided after each rain. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device.

### 3.02 FIELD QUALITY CONTROL

- A. Inspections: The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, every 7 days during periods without rainfall, daily during periods of prolonged rainfall, and within 24 hours of the end of any storm that produces 1/2 inch (13 mm) or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month. Inspect areas where vehicles exit the site daily. Inspections shall be conducted by a Qualified Inspector.
  1. Inspections Details: Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected by the Contractor for evidence of, or the potential for, pollutants entering the local drainage system. Erosion and sediment control measures identified in the ESCP shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.
  2. Inspection Reports: For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SSCP, maintenance performed, and actions taken. The report shall comply with the requirements of Article 1.06. The report shall be furnished to the Commissioner. A copy of the inspection report shall be maintained on the job site.
  3. Corrective Actions: Within one business day after completion of an inspection, submit notification identifying any corrective actions that must be

taken. Within one business day of this notification, the Contractor shall begin implementing corrective actions and shall complete corrective actions within a reasonable time frame.

3.03 CLEANING

- A. Clean all silt and sediment from sumps during and at the conclusion of the Work. Interim cleaning shall be such that the performance of the sump, pumps and piping, used in the performance of work, is not hindered, or at the direction of the Commissioner.

-END OF SECTION-

**Section 16600**  
**LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish and install a lighting control system consisting of a workstation, lighting control and energy management program, monitoring, relays, controls and accessories including all required wire, raceways and connections as specified or required for a complete and operating system. Provide a system in accordance with the requirements specified under this section, as shown on the Contract Drawings and as required for the lighting system to comply with the NYCEC.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 – Basic Electrical Materials and Methods
- B. Section 16055 – Electrical Requirements for Shop Assembled Equipment
- C. Section 16121 – Wires and Cables 600 volt and Below
- D. Section 16130 – Electrical Raceway Systems
- E. Section 16140 – Wiring Devices
- F. Section 16264 – Uninterruptible Power Supplies
- G. Section 16443 – Panel boards
- H. Section 16491 – Control Components and Devices
- I. Section 16511 – Lighting

**1.03 REFERENCES**

- A. Lighting fixtures and devices shall comply with the latest applicable provisions and recommendations of the following:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code
  - 3. NYSEC - New York State Energy Code
  - 4. UL 924 - Emergency Lighting and Power Equipment
  - 5. LCA - Lighting Controls Association
  - 6. EPA - Energy Policy Act

**1.04 SUBMITTALS**

- A. Furnish all submittals, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.

## B. Contractor shall submit the following:

1. Manufacturer's catalog data sheets indicating all technical information and construction details for each type of lighting controls and energy management system component
2. Lighting Control Cabinet Shop Drawings, including all relays, contactors, communication cards, wireways, timers, indicating lights and terminal strips.
3. Point to point wiring diagrams for lighting control panels
4. Complete Hardware and Software documentation for PC and Accessories.
5. Operations and maintenance manuals for lighting control system
6. Complete facility floor plans indicating all components, raceways, cabinets and wiring of the Lighting Control System.

## 1.05 QUALITY ASSURANCE

- A. All equipment, controls, monitors and devices shall be UL listed and approved for use in the City of New York. All shall be in accordance with the applications indicated on the Contract drawings and these specifications. The descriptions and catalog numbers serve to establish the quality, appearance and performance of the specified items.
- B. All items shall be the products of lighting controls equipment manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified lighting controls.
- C. The Contractor shall be responsible for reviewing all drawings and coordinating with all trades the installation of lighting controls and devices. They shall be compatible with the lighting fixtures and accessories supplied under Division 16 Section 16511 Lighting.
- D. All devices, controls, monitors and equipment shall be of the highest quality material and construction for their respective types.
- E. The supplier shall have a minimum of 5 years successful experience in design, installation and operation of lighting control of the type specified herein. In addition the contractor shall supply evidence of the works' compliance to the NYSEC.

- F. Installer shall be certified by the various manufacturers and engineered systems suppliers contributing to this system, as qualified to design and install their products.
- G. Sensors, switches and other operable components of the Lighting Control System located in areas other than offices shall be suitable for installation in industrial locations and for hard service as appropriate

#### 1.06 SYSTEM DESCRIPTION

##### A. General

- 1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional NYSEC compliant and approved Lighting Control system including controls, wire, raceways and connections. The System shall comply in all respects with all pertinent codes, rules, regulations and laws of the New York State Energy Codes, local jurisdiction, and NYC Construction Codes as they apply to this building. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (UL) listings. The system shall be suitable for the intended application.
- 2. The Lighting Control system shall consist of:
  - a. Lighting Control workstation
  - b. Software and graphics for monitoring and control
  - c. Lighting Control relay panels
  - d. Local switches and occupancy sensors
  - e. Level Control Panels
  - f. Photocells and Timers
  - g. Connection to the SCADA System for monitoring
  - h. Connection to a remote central monitoring station. The City shall dedicate one direct outside access data line for this service:

- B. The system shall be designed to monitor and control the building's exterior and interior lighting fixtures and monitor the status of each of the buildings lighting areas using the following type of control devices:

- 1. On - Off Controls
  - a. Wall Switches (1 and 3 way)
  - b. Photocell
  - c. Timer
  - d. Occupancy Sensor



2. Level Controls

- a. Bi-Level Ballasts
- b. Multi-Level Switching
- c. Photocell

3. Relays and Multi Pole Contactors

- a. Timer Controlled
- b. Multi-circuit contactors

C. The following types of control will be required:

1. Pier Level

- a. Offices: Multi-Level Switching, Occupancy Sensors
- b. Personnel and Gallery Circulation: Time Based Switching
- c. Toilets, Lockers, Showers: Occupancy Sensors
- d. Storage: Occupancy Sensors
- e. Equipment Rooms and Machine Shop: Local Switches
- f. Lunch Room: Occupancy Sensors

2. Outdoor Parking and Circulation Areas

- a. Small Vehicle, Photocell and Time Based Switching
- b. Ramps, Gates and Outbound Scales: Photocell and Multi-Level Time Base
- c. Roadway, Photocell and Multi-Level Time Base

3. Loading and Tipping Levels

- a. Supervisors Office, Local Switches
- b. Operations Office, Occupancy Sensor
- c. Toilets, Occupancy Sensors
- d. General Overhead Lighting, Multi-level time base
- e. Equipment Rooms: Local Switches

4. Maintenance Shop

- a. Maintenance Bay: Two level local switching for HID
- b. Storage Area: Occupancy Sensor
- c. Office: Multi Level Switching

5. Mechanical Level

- a. Mechanical, Local On-Off with monitoring

6. Outdoor Lighting

- a. Flood and Canopy Lights, photocell on- Time Clock Off
- b. Security and Sign Lighting, Photocell On and Off

1.07 DELIVERY, STORAGE AND HANDLING

- A. Lighting control and Energy Management equipment and devices shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's instructions.

1.08 EXTENDED WARRANTY

- A. Manufacturers of lighting control system and emergency lighting power system shall provide an extended warranty for minimum of two years.

1.09 SPARE PARTS

- A. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.
- B. The following spare parts shall be furnished:
  - 1. 10 percent of each type of occupancy sensor and photocell but not less than 5 each.
  - 2. 10 percent of each type relay, timer, switch and contactor, but not less than 2 each.
  - 3. 1 spare monitor of each type.
  - 4. 5 backup copies of the software program for the system on digital disks
  - 5. Two (2) start-up copies for the PC operating system.
- C. Packaging: Deliver all spare parts neatly wrapped or boxed, indexed and tagged with complete information for use and reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. General: The lighting control and energy management descriptions and catalog numbers listed herein are used to indicate the acceptable quality, design and performance characteristics of approved components.

- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Controller, Relays and Devices
  - a. General Electric Company
  - b. Lutron
  - c. Sensorswitch
  - d. Hubble Incorporated
  - e. Lighting Controls and Design
2. Workstation
  - a. Hewlett Packard
  - b. Dell
  - c. Sony
3. Photocells
  - a. Tork
  - b. Intermatic
  - c. Paragon
4. Lighting Contactor
  - a. Square D, Class 8903
  - b. ASCO
  - c. General Electric
5. Timers
  - a. Intermatic
  - b. Agastat
  - c. Eagle

## 2.02 LIGHTING CONTROL SYSTEM

- A. General: Provide a lighting control and energy management system that consists of lighting relay control panels, dimming modules, occupancy sensors, photocells and timers connected to a local workstation and directly as hereinafter specified.
- B. Change of State Enunciation: States for all lighting control relays shall be transmitted to the workstation and the SCADA within 2 seconds or last change. Transmit all Programmable System Switch input changes of state.

- C. Activity Logs: System shall store the last 1500 relay events including the time, new state, and cause for the change in state. Annunciate to the workstation and SCADA when the table is 25%, 50%, 75% and 100% full.
- D. Workstation: Provide a personal computer having following minimum features:
1. Form Factor: Tower or Mini-Tower
  2. Processor: Dual Core Intel Xeon Processor at 3.0 GHz minimum
  3. Memory: 2GB of DDR2 SDRAM
  4. Monitor
    - a. 23" 16/9 LCD Type: TFT active matrix
    - b. Video Input Signal: Analog RGB and digital HDMI
    - c. Pixel Pitch: No greater than 0.294 mm
    - d. Viewing Angle: 85 degrees nominal
    - e. Contrast Ratio: 600:1
    - f. Brightness: 250 nits
    - g. Prime Mode: 1280 x 1024 (SXGA)
    - h. Mounting: VESA-compliant adapter plate
  5. Graphics accelerator card 256 MB minimum
  6. Hard Drive: 500 GB SATA 3 Gb/s, 7200 RPM minimum
  7. Optical Drive: 16X DVD+/- RW/CD-ROM and Blue Ray
  8. Mouse: Microsoft System Intellimouse
  9. Network Card: Broadcom NetXtreme 10/100/1000 Gigabit Ethernet controller-PCI Express or equal
  10. Keyboard: 104+ keys
  11. Documentation: Provide all documentation, manuals and licenses
  12. Warranty: 3 Year Basic Warranty and 3 Year NBD On-Site Service
  13. Safety/Regulatory: UL, FCC B, approved
  14. Latest revision of software at time of bid required:
    - a. Windows XP Professional
    - b. Microsoft Office Professional
    - c. McAfee Virus Scan
    - d. Roxio Easy CD/DVD Creator
  15. External Inputs: Ethernet, optical, USB 2.0 and 3.0, telephone.
  16. Outputs: Audio Speakers and Printer
  17. Speakers: Two small full range speakers for desk top mounting with superior articulation for this application.

E. Operator's Software: Provide lighting control system operator's software that has the following minimum features:

1. All programming and editing shall occur offline on a PC. Data shall be entered through a simple menu-driver software package. All operating data for all relay panels shall be entered on the PC database.
2. Basic operating software shall include English descriptions of relay's "circuit designation", "circuit description" and "direct wired low voltage switches" can be programmed. Panel master switches, programmable system switches, and telephone override code info can also be entered. Automatic carryover of descriptions to all other program/monitor/control functions. System shall be capable of printing above information.
3. Up to 12 different passwords per site.
4. Software shall be programmed to enable transmission of information about the buildings lighting system and control status and operation to the SCADA System or remote from the building monitoring facility.

F. Dataline Power Supply: Provide a dataline power supply capable of powering up to 4000 feet of dataline having the following features:

1. Ambient Temperature: 0 to 55 degrees C
2. Humidity: 0 to 95 percent, non-condensing
3. Power Requirements: 115VAC

G. Dataline Interface: Provide a dataline interface that converts the dataline communications signal to an RS232 output having the following features:

1. Ambient Temperature: 0 to 55 degrees C
2. Humidity: 0 to 95 percent, non-condensing
3. Power Requirements: 115VAC
4. Visual indication:
  - a. Power On
  - b. On-Line Status
  - c. Dataline Power
  - d. Link Failure
  - e. Field Failure

5. Alarm Contact: 2 amps at 28VAC.

H. Lighting Relay Control Panels: Relay control relay panels shall be provided for the on-off control of lighting fixture branch circuits adjacent to each lighting power panel. Relay control relay panels shall be UL listed and consist of the following:

1. Enclosure: NEMA 12 rated steel enclosure sized to accept 48 relays, terminal blocks, control devices and cards. Finish shall be corrosion resistant and appropriate for the location where installed.
2. Cover: Surface with captive screws in a hinged, lockable configuration. A wiring schedule directory card shall be affixed to the cover's back to allow identification of circuits/relays/loads controlled if the door is open or the cover is off.
3. Interior: Bracket and circuit board backplane with pre-mounted relays. Interiors shall be equipped with up to 48 relays and provide true ON/Off indication of relays status through LEDs mounted on the circuit board. Each relay shall be capable of direct ON/OFF control by a low voltage switch or occupancy sensor. Relays shall be momentary-pulsed mechanically latching contactors rated at 20 amps, 277 VAC. They shall attach to the Interior by a single plug-in connector.
4. Power Supply: Transformer assembly with two 40VA transformers with separate secondary's; one providing power to relays and associated low voltage switches and sensors, the second providing power to the LEDs and optional automation cards. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes. Power supply shall be rated for available power supply (277 or 120 VAC), 50/60Hz. +/-10%.
5. Relays shall be included which perform bi-level lighting control functions for designated lighting circuits controlled from the system workstation or SCADA. HID startup control box (Hubbell SLIP-3 Panel or equal) shall be provided to interface with the light fixtures for bi-level lighting control.
6. Plug-in Intelligence Cards: Plug-in intelligence cards in each panel shall provide programmable operation and networking capability with the following capabilities:
  - a. Status and Runtime Data - store the current status of all relays with historical runtime data.
  - b. Communications: Support of two communications ports, an RS232 port and a dataline port. Either or both may be used for programming, monitoring, and control. The dataline shall allow simultaneous operation of multiple lighting relay control panels to the personal computer.
  - c. Off-Line Programming: The program shall be provided with English descriptors of all loads, windows, and help screens.

- d. Dataline Communications: Twisted pair (18/2) dataline with random access and bus arbitration capability of up to 500 panels and no loss of data.
- e. Relay driver cards: Each card shall provide 12 relay outputs and 3 programmable switch inputs.
- f. Panel controller card: Each controller shall be capable of providing all logic, control, runtime data, status information, and communications functions for up to 48 relays.

I. Printer

- 1. Provide an office type printer/scanner/copier/fax inkjet color printer as an accessory to the workstation.
- 2. Printer shall be high quality and provide high speed printing.
- 3. Printer shall be capable of duplex (both side) printing
- 4. Printer shall handle letter, legal and 11x17 paper.
- 5. Printer shall be capable of network operation.
- 6. Printer shall handle standard and legal paper.
- 7. Provide a moveable cart with paper storage to support the printer.

2.03 OCCUPANCY SENORS

A. General: Occupancy sensors shall be provided for individual control of Offices, Locker, Control and Storage Rooms and small spaces in the Personnel and Maintenance Areas of the building.

- 1. Sensors shall be line voltage type for direct control of the lighting fixtures in small offices and spaces as indicated on the plans.
- 2. Where multi-level switching of the area is required sensors shall have 2 dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- 3. Sensors shall offer a minimum on timer of at least 16 minutes.
- 4. Sensor setting adjustments shall be digital and be made using a pushbutton.
- 5. In high humidity or cold environments sensors shall be coated and rated for condensing humidity and -20 ° Fahrenheit operation.

6. Sensors shall have 5 year warranty.
7. Sensors in wall switch enclosures and shall be capable of auto on, manual on and be able to detect small hand motion at 20' in small areas and 40' in large areas.
8. All wall sensors shall have a "predictive off mode where user can manually turn off the lights when leaving and have them come automatically on when returning.
9. Line and load wire connections shall be interchangeable, such that an installer cannot make an improper connection.
10. Ceiling mounted sensors requiring multi level switching shall have two dual relays. Each relay shall have independent programmable occupancy time delays.
11. Sensors shall be 120 or 277 volt rated whichever is required for the supply voltage.
12. Ceiling mounted sensors shall be dual mode type capable of detecting minor motion successfully.
13. Where dual mode sensors are inappropriate a single mode (ultrasonic) type may be used.

#### 2.04 LIGHTING CONTACTORS

- A. Multiple contact, electrically held type, continuous duty for all type of lamp loads including high intensity discharge (HID) lamps. Number of poles per contactor and ampere ratings shall be as indicated on the Contract Drawings.
- B. Construction: Flush dead back design with arc shields and barriers to prevent pole-to-pole flashover. All parts accessible for inspection and maintenance. Contacts readily replaceable from front of panels. Contactors suited for non-inductive loads. Interrupting capacity 150% of rating with no derating for high inrush loads.
- C. Enclosure: NEMA 12 surface type enclosure complete with lighting contactors, control relays, Hand-Off-Automatic selector switches, and provision for pad-locking Provide relays, push buttons, selector switches and indicating lights as specified in Section 16491 - Control Components and Devices.
- D. Selector switches and coil voltages of lighting contactors and control relays shall be rated 277V.



## 2.05 PHOTOELECTRIC CONTROLS

- A. Photoelectric controls shall be cadmium sulphide hermetically sealed cell, fully temperature compensated, with minimum of 15-second time delay to prevent false switching and adjustable activation from 1-5 fc "On" and 3-15 fc "Off".
- B. Voltage rating shall be 277V or 120 V as needed.
- C. Photoelectric cells shall be provided with nipple for conduit mounting, adjustable swivel with locking nut, and gasketed polycarbonate housing. Photocells shall be installed where indicated on the Contract Drawings.

## PART 3 EXECUTION

## 3.01 INSTALLATION OF DEVICES

## A. Lighting Control Relay Panels

- 1. Panels shall be mounted rigidly and securely to the building structure or to supporting devices, which are rigidly and securely supported to the building structure.
- 2. Panels shall be fastened with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units and with machine screws or welded studs on metal.
- 3. All panels shall be mounted parallel or perpendicular to walls, such that panels are installed in a neat and professional manner.
- 4. Provide adequate clearance for inspection, maintenance and replacement of panel components.
- 5. Panels in damp or corrosive areas shall be mounted on channels off the wall to permit air circulation behind them.
- 6. Panels in industrial or adverse environments shall have their electronics conformal coated.
- 7. Panels shall be mounted adjacent to the Lighting Panel containing the circuits they are controlling.

## B. Occupancy Sensors

- 1. Ceiling mounted sensors controlling the same load shall be wired in parallel.
- 2. Equipment shall be installed in accordance with manufacturers' instructions and recommendations.

3. Avoid locating ceiling mounted sensors near HVAC air diffusers.
4. Sensors shall be installed at locations indicated on contract drawings. Sensor layout was based on Sensorswitch, Contractor is responsible for location and quantity of sensor if alternate manufacturer is used.

C. Photocells

1. Photocells: Install photocells 6-inches above roof peak with the lens facing North.

3.02 FIELD TESTS

- A. After installation, the completed lighting control system shall be field tested for operation and conformance. The field tests shall be witnessed by the Resident Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:
  1. Wiring continuity test shall be performed.
  2. Fixture and control operation test for individual control areas shall be performed.
- B. The Contractor shall provide a field test report. The report shall identify the test performed and the results obtained.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Furnish a qualified manufacturer's service representative to assist in the installation of the lighting control, check the installation before it is placed into operation, assist in the performance of field tests, observe the initial operation and train the plant operations and maintenance staff in the care, operation and maintenance of the system.
- B. The Contractor shall provide equipment start-up services, programming, and training to ensure that the lighting system is fully operational.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results,

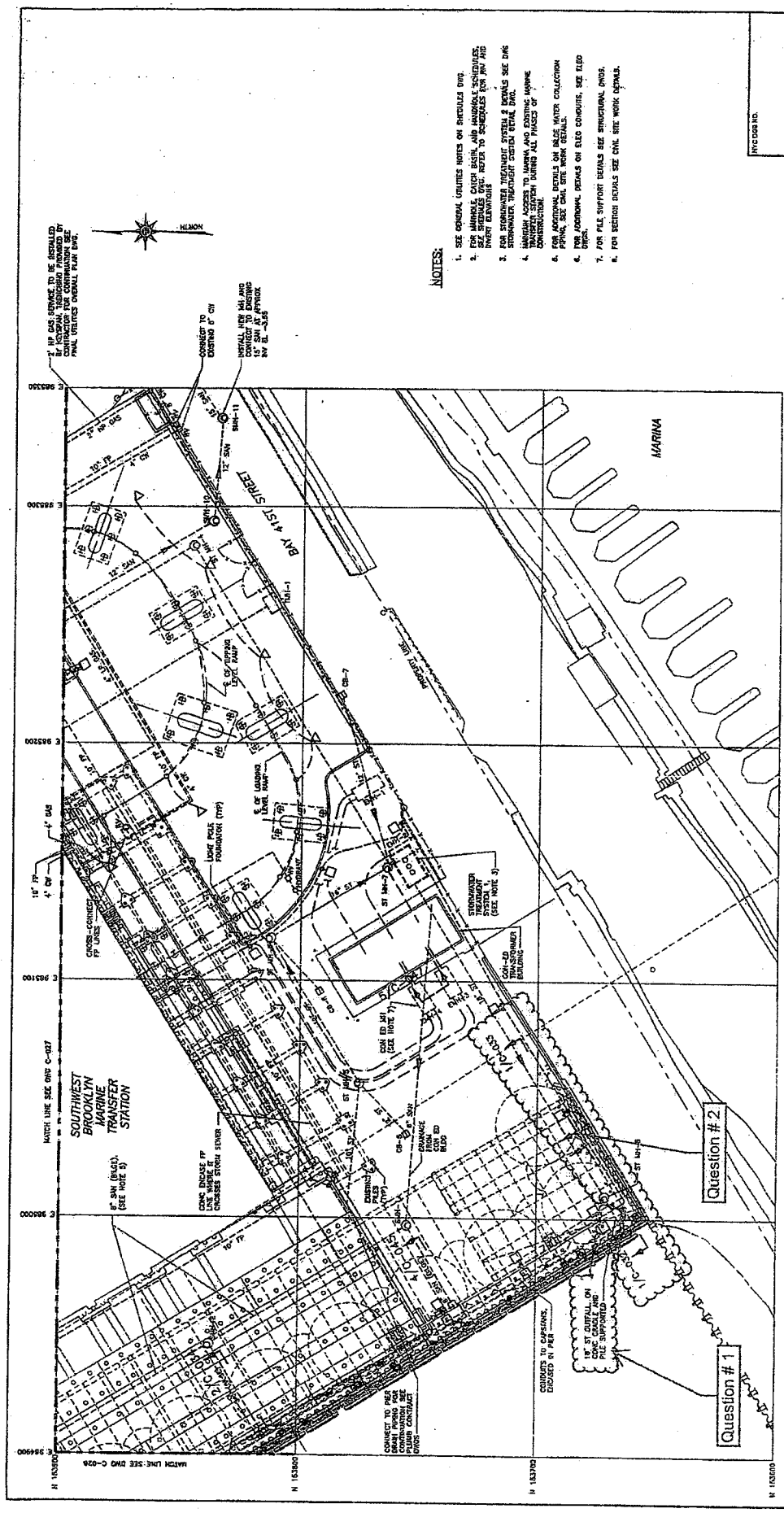
3.04 CLEANING OF DEVICES

- A. Devices shall be cleaned inside and out to remove construction dust prior to substantial completion.

3.05 ADJUSTING

- A. Occupancy Sensors: Adjust location as required to obtain satisfactory performance.
- B. Photocells: Adjust direction, height and location as well as sensitivity (turn on and turn off levels) to obtain satisfactory performance.
- C. Test all low voltage switches for satisfactory operation.

-END OF SECTION-



**NOTES:**

1. SEE GENERAL NOTES ON SHEETS 001-004
2. FOR MARINE CATCH BASIN AND MARINE TREATMENT TANK SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR SHUNT EXHAUSTS
3. FOR STORMWATER TREATMENT SYSTEM & DETAILS SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR MARINE TREATMENT TANK
4. MARINE TREATMENT TANK SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR MARINE TREATMENT TANK
5. FOR MARINE TREATMENT TANK SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR MARINE TREATMENT TANK
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7. FOR MARINE TREATMENT TANK SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR MARINE TREATMENT TANK
8. FOR MARINE TREATMENT TANK SEE SHEETS 001-004. REFER TO SHEETS 001-004 FOR MARINE TREATMENT TANK

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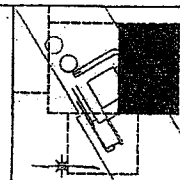
BIDDER'S SKETCH RRC-RFI-012A

Question # 1

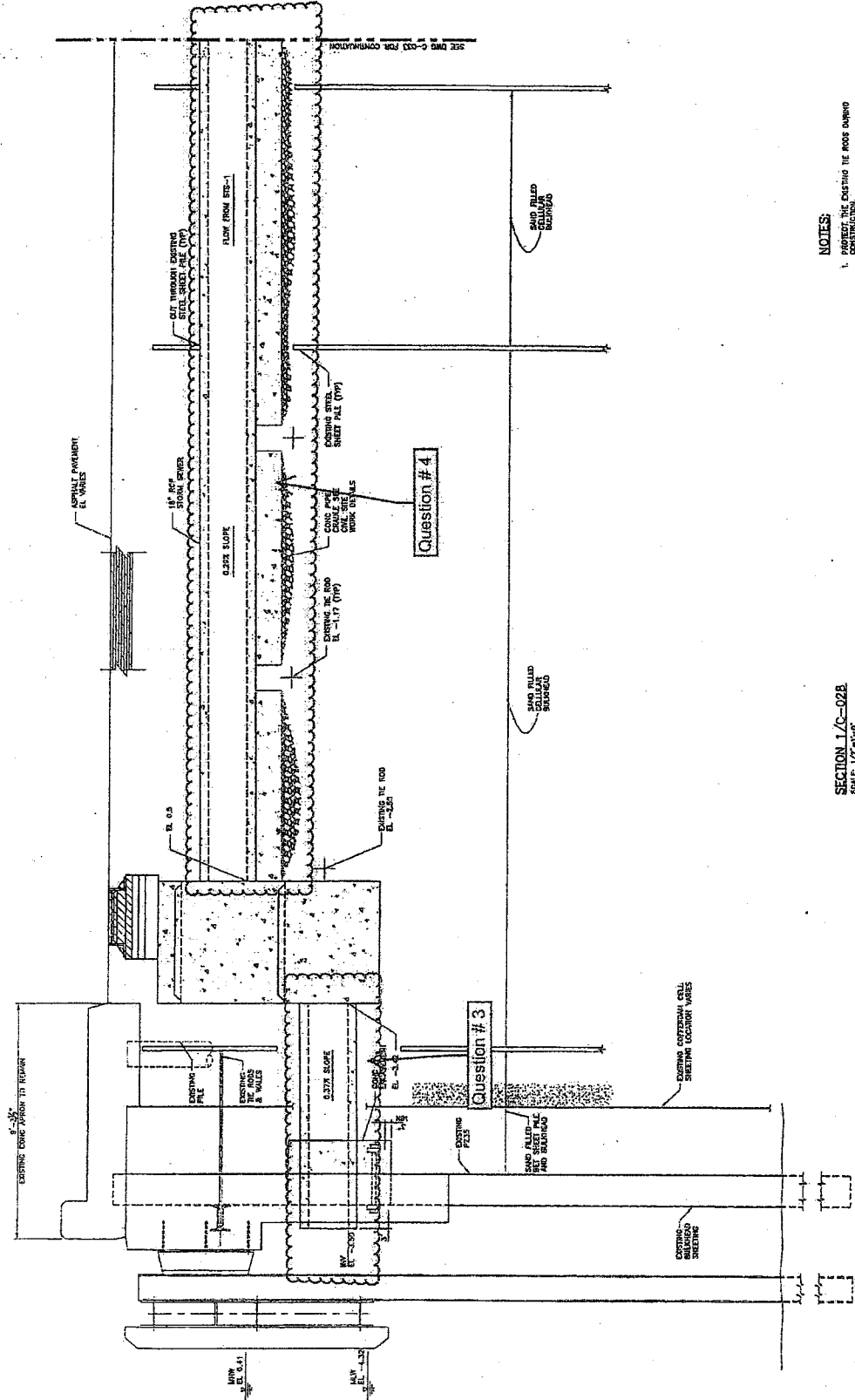
Question # 2

CONTRACT NO. 2 CIVIL/SITE WORK	
DEPARTMENT OF SANITATION MARINE DEPT OF SANITATION SOUTHWEST BROOKLYN MARINE TRANSFER STATION	SHEET NO. 31 OF 704 DATE: APR 2011

FINAL UTILITIES - SHEET 3



FOR THE CITY OF NEW YORK  
 DEPARTMENT OF SANITATION  
 MARINE DEPT OF SANITATION  
 SOUTHWEST BROOKLYN  
 MARINE TRANSFER STATION



NOTES:  
1. EXISTING TIE RODS DURING CONSTRUCTION.

SECTION 1/C-02B  
SCALE: 1/8"=1'-0"

BIDDER'S SKETCH RRC-RFI-012B

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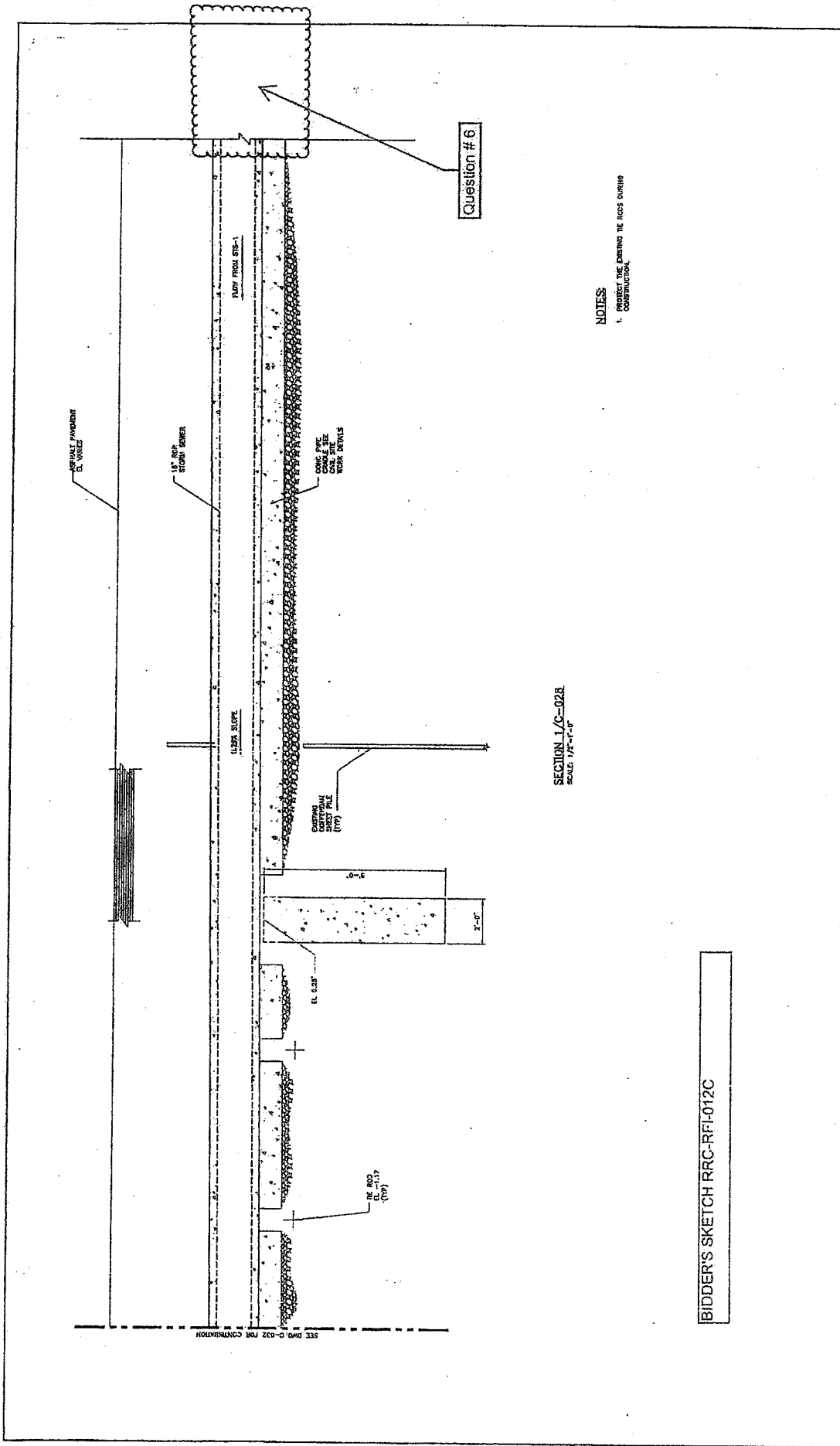
FOR NEW YORK CITY  
DEPARTMENT OF SANITATION  
SOUTHWEST BROOKLYN  
MARINE TRANSFER STATION

CONTRACT NO. 2  
CIVIL

STORM OUTFALL - SHEET 1

NYC DSR NO.

FILE NAME: CIVIL/C-02B  
DWG: C-032.00  
SHEET NO. 32 OF 708  
DATE: JAN 2012



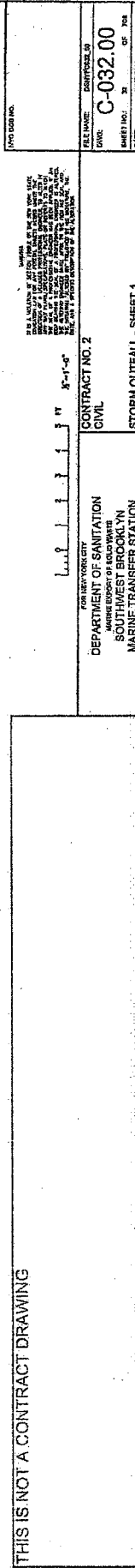
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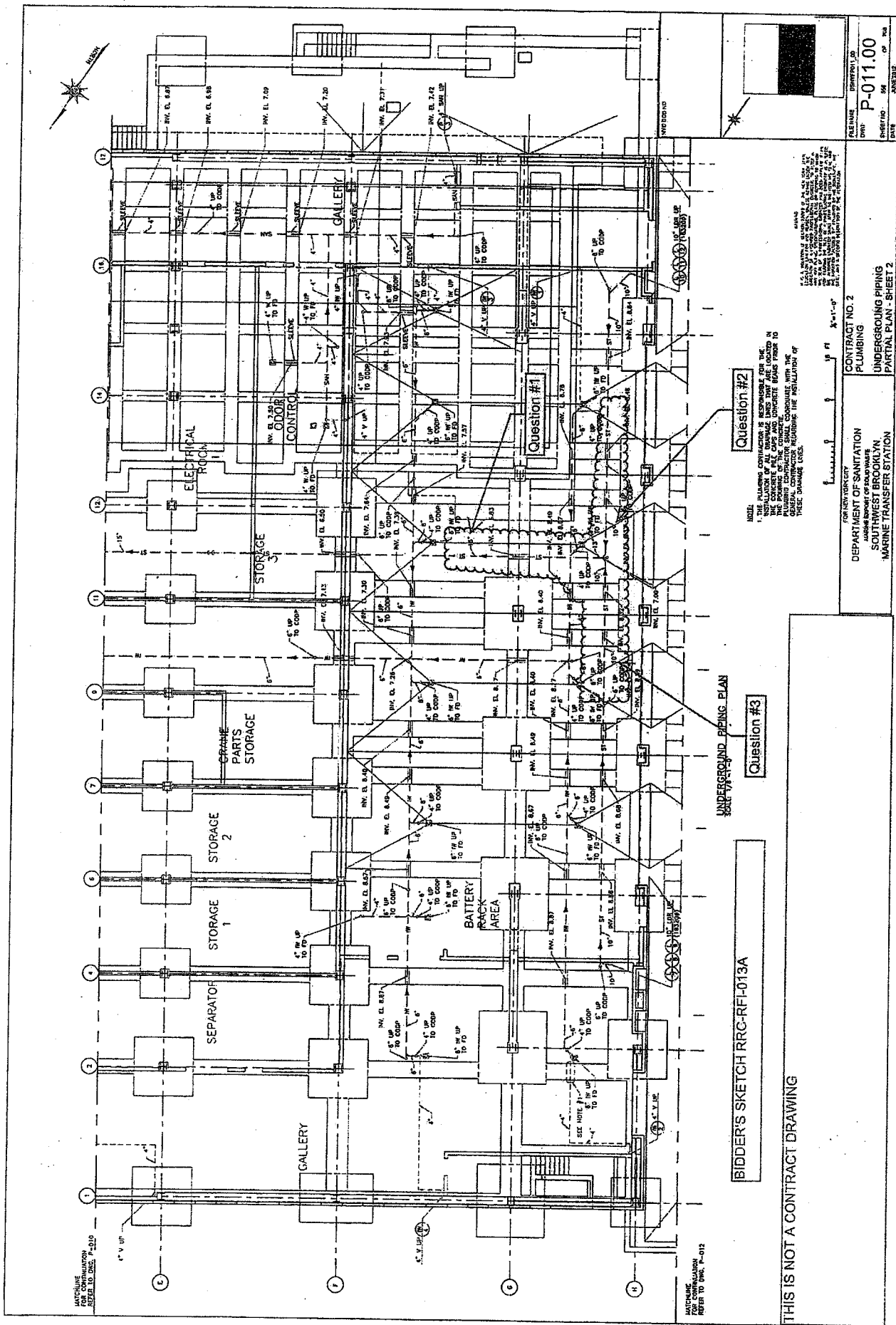
SECTION 1/C-028  
SCALE 1/2"=1'-0"

BIDDER'S SKETCH RRC-RFI-012C

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CONTRACT NO. 2 CIVIL DEPARTMENT OF SANITATION SOUTHWEST BROOKLYN MARINE TRANSFER STATION		CONTRACT NO. 2 CIVIL DEPARTMENT OF SANITATION SOUTHWEST BROOKLYN MARINE TRANSFER STATION	CONTRACT NO. 2 CIVIL DEPARTMENT OF SANITATION SOUTHWEST BROOKLYN MARINE TRANSFER STATION
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# ADDENDA CONTROL SHEET

**TITLE: Southwest Brooklyn Marine Transfer Station – Building Construction**

## GENERAL COUNSEL

[illegible]

THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

October 18, 2012

**ADDENDUM No. # 3**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

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This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

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The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for October 25, 2012, at 2:00 pm is rescheduled to November 15, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

Please note that all Questions must be submitted in writing no later than October 24, 2012

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to Addendum #2:**

See Attachment B.

4. **Revisions to Addendum to the General Conditions:**

See Attachment C.

5. **Revisions to Specifications:**

See Attachment D.

6. **Revisions to Drawings:**

See Attachment E.

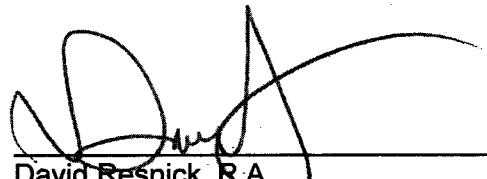
7. **Revisions to the Bid Booklet:**

See Attachment F.

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THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
\_\_\_\_\_  
David Resnick, P.E.  
Deputy Commissioner

\_\_\_\_\_  
Name of Bidder

By: \_\_\_\_\_

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT A – BIDDERS QUESTIONS AND DDC RESPONSES**

No.	Bidders' Questions	DDC Responses
1	Please reference spec section 02839-14 for MSE Retaining Walls. The course aggregate size No. 57 is a clean ½" stone blend. We don't believe you can get the compactive effort of 95 percent modified Proctor density specified for this material. Please advise if you feel it is possible. We understand you need a relatively free draining material here but is this what you want, or are you looking for a well graded subbase blend with 0-10% passing the No. 200 sieve?	We call for 57 stone and do believe that it is possible to get 95% compaction. Reinforced Earth Company has stated the following: "#57 is a self compacted material but not to the desired 95%, grading with 4 passes by a roller are often used to get you to 95%."
2	Is concrete cradle required under all storm sewer piping or only under the 18" RCP outfall?	The concrete cradle has been removed and is not used to support any storm sewer piping. See Revised Drawings C-032.01 and C-033.01 issued in Addendum 2. Also, Drawing C-028 is revised in Addendum 3. See Attachment E – Revisions to Drawings.
3	Please provide typical trench details for each utility.	Refer to Specification Sections 02316 – Excavation, Section 02317 – Backfilling, and 02503 – Installation of Buried Pipelines.
4	Please refer to Schedule B of the Addendum to the General Conditions. Under Schedule B, Guarantees and Warranties, a number of the materials or equipment state the length of warranty as "lifetime". Is that meant to be the "lifetime" of the facility? If so, what is the expected "lifetime" of the facility? The manufacturers are expressing concern.	Schedule B of the Addendum to the General Conditions is revised in Addendum #3. See Attachment C - Revisions to the Addendum to the General Conditions.
5	Page 4 of 50 of the Addendum to the General Conditions under Amended Articles states that Article 1.26, Security Guards/Fire Guards on the site is replaced with Section 01561, Site Security. Under Part 1, 1.02 of Section 01561, Site Security, it refers you back to the Conditions for Security Guards and Fire Guards (the article that was just replaced). Are these Amended Articles supplementary or replacing? Do you require security guards?	This was clarified in Addendum 2. See Attachment A (question no. 16), Attachment B - Revisions to Addendum to the General Conditions and Attachment C - Revisions to Specifications in Addendum #2.
6	Drawing S-120 details limits of foundation insulation in plan view and has a note to "See	Provide horizontal, under slab insulation as indicated in Addendum #3. See Attachment E -

No.	Bidders' Questions	DDC Responses
	Arch Dwgs (Typ)". Drawing A-520 shows a section of exterior wall at pier and grade level, but the note where the insulation would be says "See Structural for Additional Information." Please advise as to dimensions of any horizontal insulation and any applicable details that aren't in the specification.	Revisions to Drawings.  Provide perimeter insulation on vertical surfaces as indicated in specification Section 07211, Part 3.04.A.1. Also, Drawing A-501 is revised by Addendum #3 to clarify vertical insulation. See Attachment E - Revisions to Drawings.
7	The hard copy of the Addendum #1 drawings are not to scale (roughly 92% of scale), similar to the contract drawings. Can you please supply the addendum drawings on your website so that we can adjust the scale accordingly during our reproduction and/or please supply a disc for all addenda drawings?	PDF files for Addendum 1 drawings are available on the website.
8	As reflected above, numerous pre-bid questions are still being generated in our efforts to clarify ambiguities in the Contract or requests for additional information. In addition, the present Bid Date of October 11, 2012 falls directly on the same date as the MTA's multi-billion dollar East Side Access Contract, CM-012. This demand has caused many common subcontractors to both projects to elect to focus on CM-012, given its magnitude, and ignore for the time quoting SW Brooklyn MTS unless there is a postponement to later in October. In light of the above, please consider making the final day for Pre-Bid Questions Friday, October 12, 2012 with a revised Bid Date of two to three weeks following final Pre-Bid Questions.	The Bid Opening date is revised to November 15, 2012.
9	This letter (fax) is Skyline Steel's formal request for spiralweld pipe to be included in the acceptable pipe pile manufacturing processes on the Brooklyn Marine Transfer Center Project. We believe, and our experience has proven, that spiralweld pipe performs and installs with the same expected quality of any other pipe manufacturing process. Our experience also suggests that spiralweld will be cost effective and delivered quicker to the project site than other manufacturing processes.	Requests for substitutions may be submitted in accordance with the requirements of the Contract Documents for review during construction.

No.	Bidders' Questions	DDC Responses
	<p>There are many examples where spiralweld is accepted and installed with no problems reported or expected. One such example is the California Department of Transportation (CALTRANS) for use in large bridge structures in extreme seismic zones. A second example, spiralweld pipe is accepted by the Alaska Department of Transportation for bridge construction in extreme cold environments and even larger seismic events than those in California. And, lastly, spiralweld pipe is accepted by the US Corps of Engineers and all DOTs across the nation.</p> <p>We have carefully reviewed the specification for the Project and spiralweld meets or exceeds all the requirements listed. The ultrasonic test required is a test that all spiralweld producers can perform. The double submerged arc butt weld is the welding process used by all producers. The dimensional requirements set forth are met or exceeded by all producers. All welders and welding systems are qualified and certified to AWS D1.1 WPSs and PQRs are utilized on all pipe production. MTRs and Certificates of Compliances (COC) are produced with every manufactured pipe project. So you can see that the spiralweld process can and does produce a measurable excellent quality pipe pile.</p> <p>There are a couple of examples where the NYCDOS installed spiralweld pipe piles with no problems reported. The Marine Transfer Station Conversion Program, North Shore Marine Transfer project in Queens, NY installed 30" diameter pipe with 5/8" steel walls. Also, the Hamilton Ave. Transfer Station in Brooklyn installed 18" diameter pipe with 1/2" steel walls.</p> <p>Skyline would be very happy to answer any questions your Department might have and would be glad to arrange a plant inspection tour if you desire.</p>	
10	DDC response to Question 27, Addendum #2 in reference to Sketch RRC-RFI-012A states 18" ST OUTFALL ON CONC. CRADLE." Addendum #2 drawing, Sheet C-032.01 and	The concrete cradle for the 18" ST has been deleted. See revised drawings C-032.01 and C-033.01 issued under Addendum 2.

No.	Bidders' Questions	DDC Responses
	C-033.01 indicates by clouding that there is no concrete cradle on 18" storm sewer outfall. Please clarify.	
11	Regarding DDC Response 49, Addendum #2, which states "the 8" diameter steel pipes are intended to brace the vertical walls of the existing receiving pit that become unsupported once the existing base slab is demolished." What is meant by "base slab?" Please clarify.	The reference to "existing base slab" is that of the incinerator building that previously occupied the site and which continues to brace the top of the receiving pit walls. Demolition of that existing base slab is included in this contract.
12	Regarding DDC Response 49, Addendum #2, which states "the uncontrolled fill currently in the receiving pit is not assumed to offer any passive resistance against the structural backfill assumed to be present outside of the pit." The fill to +El 1.00 will have to be removed in order to demolish upper portion(s) of reinforced concrete walls of the receiving pit. Sheet S-011.00 shows existing sheet piling left in place along perimeter of receiving pit base slab reducing earth loads on the 5 ft. thick reinforced concrete portion of receiving pit to remain. Can the 8" steel pipe braces be eliminated? Please clarify.	Any sheet piling shown in the demolition drawings is depicted as represented on the original design drawings for the incinerator building which previously occupied this site. The existence and condition of the sheeting is not verified and cannot be relied upon, therefore no, the pipe braces cannot be eliminated and must be installed as shown on the Contract Drawings.
13	Drawings R-206.00 and R-207.00 show a "Micro-Silica concrete wearing surface" on the ramp structure. Specification section 03300 paragraph 2.01.B gives a chart with an "Exterior Ramp Overlay Bonded" With Class 50DP concrete. Is the Class 50DP concrete referring to the micro-silica overlay?	The "Micro-Silica concrete wearing surface" shown on the Ramp drawings refers to the Class 50DP concrete overlay described in Specification 03300.
14	Drawing M-640.00 has a column titled Specification Reference. In that column It references Section 10410 - Interior Signs. Section 10410 does not exist, on the other hand Section 10440 - Interior Signs does exist. Please clarify.	The correct reference is Specification Section 10440 - Interior Signs. Drawing M-640 is revised in Addendum 3. See Attachment E - Revisions to Drawings.
15	The following deals with Specification Section 14696 - Mooring Capstans: Currently, these specifications call out a 15 HP unit and 12,450 lbs of line pull @ 45 fpm. The required efficiency to run a capstan at this speed and this horsepower exceeds 100%. It is our opinion that there are no gearboxes that can achieve even a consistent 100% efficiency rating. There are capstans that can run at that speed and line pull, but to rate the capstans for that load is not possible, as it would require a rating system of above	Section 14696 is revised in Addendum 3. See Attachment D - Revisions to Specifications.

No.	Bidders' Questions	DDC Responses
	100% efficiency. Even a 94% efficient gearbox would require 17.988 HP to achieve the loads listed. Therefore, we would like clarity that it is either A) acceptable to provide the highest producing capstan in a 15 HP model, or B) provide any 20 HP model to meet your requirements. Please clarify.	
16	There appears to be a discrepancy on drawing S-802.00 regarding the bolts attaching the rubber fenders to the king piles. In the front view it shows 1-1/4" dia SS bolts (14 required). In the elevation it shows 5/8" dia galvanized bolts. Can you clarify exactly what bolts are required and where?	Bolts shall be 1-1/4" diameter galvanized A307 bolts with galvanized washer, tapered washer & double nuts. The number of bolts should correspond to the number bolt holes on the fender units, which are typically spaced as shown in the "Front View" on Drawing S-802.01. The number will vary based on fender length. Drawing S-802.01 is revised in Addendum No. 3 to reflect the correct bolts as described above. See Attachment E - Revisions to Drawings.
17	On Architectural Drawings, the plan 'Notes #C' indicate that all partitions are type 1, unless noted. The detail at the top of the CMU wall to the underside of the slab does not indicate any clip angles. However within the notes shown on Drawing A -500 [Note #3] indicates that all 'Rated' walls require clip angles. What is required? What are the sizes and spacing? On Drawing A -601, here does detail 'D3' occur- [walls at anchor points]?	Drawings A-500 and A-601 are modified by Addendum 3. See Attachment E - Revisions to Drawings.
18	On drawing A-308/Det. C3 [Countertops] shows that a stainless steel tubular support frame is required under the countertop in the Machine Shop Office. This counter does not have a sink.	Provide stainless steel tubular support frame under the countertop in the machine shop office even though it doesn't have a sink.
19	On revised drawing A-900 the gates and fences have been revised to 'open grilles'. However what happens to the supports? Are we to use the details shown on drawings A - 901 & A-902?	Yes
20	There are numerous inconsistencies between the control and instrumentation conduit and cables that appear on drawing E-122 and those that are represented in the schematic diagrams sheet #1 through #5 on drawing E-110 thru E-115. Please provide a clarification. Reference conduits C-7, C-12, C-16, C-17, C-37, C-38, C-80, C-83, C-84, C-104 and C-105.	Please see Addendum 2, Attachment D - Revisions to Drawings, Drawings E-122 and E-110 - E-115 for revisions to the control and instrumentation drawings and resubmit any subsequent questions.
21	Bid Item 15 is for either the unit price for 103,400 lf in length of 20" Steel Pipe Piles vs. 669 each of quantity of 150-Ton Composite	The standard 150-ton pile included in Specification Section 02364 was designed by the Engineer and therefore able to be estimated. The



No.	Bidders' Questions	DDC Responses
	Tapered Piles. In order for the Authority and the contractor to evaluate the alternates on an equal basis we respectfully request that the bid pricing options be either bid as both "each" or both "linear feet".	<p>Bid Form unit price measurement of "linear feet" is appropriate based on the Engineer having estimated a total length of piles, while still affording protection to the Contractor due to any variability in actual driving conditions.</p> <p>The alternate 150-ton pile type, which is an optional bid item, is based on the performance requirements of Specification Section 02365, and represents a design to be performed by the Contractor. The total length of alternate pile cannot be estimated uniformly due to the fact that multiple potential pile designs may meet the specified requirements. As such, to be able to compare all proposed alternates that may be included in competing bids, the Bid Form unit price measurement of "per pile" is appropriate.</p>
22	In Contract Specification Section 15815 – Duct Insulation, the footer in the bottom right hand corner of the pages is labeled "Fans". Please clarify.	The footer is revised by Addendum 3. See Attachment D – Revisions to Specifications.
23	Section 02360, Part 3.01C states that shoring systems that retain earth on which the support or stability of existing structures or utilities is dependent shall be left in place at the completion of the work. Please verify that in the area of the MSE wall this temporary sheeting may be removed after construction of the MSE wall. If this sheeting is to remain at completion of the project, please specify if this temporary sheeting is to be coated?	The temporary sheeting used during the over-excavation and replacement of the soils at the MSE wall may be removed at completion. If at the MSE wall area the contractor is directed to leave temporary sheeting in place as described in Section 02360, Part 3.01C, coating is not required.
24	Do second and third tier subcontractors qualify either under the target participation plan 10% and/or 50% of the total M/WBE subcontractor participation goal?	No, not at this time.
25	Can suppliers contribute to the target participation plan of 10% or subcontractor participation goal of 50%.	<p>Supply purchase, <u>alone</u>, <b>does not</b> count toward either participation goal.</p> <p>"Purchase/Install" <b>does</b> count toward either participation goal.</p>
26	Drawing S-110 indicates that the top of slab at the pier level is 11.50 unless otherwise indicated (note on center of drawing indicates el. 11.00 which we believe to be incorrect). Drawing S-110 also indicates a slab thickness of 18" north of column H and 24" south of column H. The pile cap schedule on S-120 indicates the depth of PC4A to be 4' 6". This would mean that the bottom of pile cap	<p>Drawing S-110.00 is revised in Addendum 3. See Attachment E, Revisions to Drawings. The correct top of slab high point elevation is 11.50 as stated in Note 2.1 and Note 3.1 on Drawing S-110.</p> <p>On Contract Drawing S-120, the bottom of pile cap elevations are confirmed to be correct as-is. Not all piles caps are located immediately below</p>

No.	Bidders' Questions	DDC Responses
	elevation, of PC4A, should be 5.50. Pile cap schedule on S-120 shows bottom of pile cap elevation as 0.50. Please confirm bottom of pile cap elevations of all pile caps on the pile cap schedule.	the Pier Level slab. While this is the case for interior pile caps, perimeter pile caps are significantly lower to account for the 4'-0" +/- elevation difference between finished grade outside and the Pier Level slab inside the MTS. Please refer to the various sections and details depicting this configuration on Contract Drawings S-127 through S-138.
27	In Addendum #2, Question 27, you state that Drawing C-023 is revised in Addendum #2. We did not see that drawing in the revised packet. Did you mean Drawing C-028? If so, the note regarding Pile Supported was circled as a revision but did not change. Please advise if this note should be "18" ST Outfall, on Concrete Cradle and Pile Supported," per your answer in Addendum #2, Question 27.	In Addendum #2, the reference to C-023 was incorrect. The correct reference is C-028. The concrete cradle has been removed.  Also, note Drawing C-028 is revised in Addendum 3 (see Attachment E, Revisions to Drawings).
28	Please refer to Drawing Z-002 (Sheet 52). It shows dredge limits and references Note 5, which states "Remove all materials & debris within dredge limits to project depth." It is very difficult for the bidder to establish a cost for this work, not having pay lines to go by and not having information to establish what quantity of material to estimate. We respectfully request that the Agency establish an allowance item to pay for this work.	Dredging is a unit cost item. An assumed dredge quantity is provided in the Bid Schedule.
29	Per Addendum #2, the "Conc Cradle on Pile Detail" on Drawing C-042 was deleted and Drawings C-032 and C-033 were revised to remove the cradle shown. However, per notes and specifications to follow NYCDEP Sewer Main Standards, cradle would be required under all storm and sanitary piping. Please either provide typical sections for the various utilities or confirm sanitary and storm systems shown will require cradle under them per NYDEP standards referenced.	The pipes do not require concrete cradle supports. Also see response to question 3.
30	In reviewing the revised Utilities Schedule on Drawing C-030.01 (issued in Addendum #2), we still do not believe the inlet and outlet elevations for the various manholes work in providing adequate sloping between the manholes. For example, the pipe run from ST MH-7 to ST MH-6 is an ~60' run without any elevation change (1.63 is shown for MH-7 Outlet and MH-6 Inlet). Similar problems	Revisions to the storm manhole schedule and sanitary manhole schedule are provided in Addendum 3. See Attachment E, Revisions to Drawings.

No.	Bidders' Questions	DDC Responses
	exist throughout the schedules. Similarly, the pipe run from St MH-10 to ST MH-11 runs uphill (-0.82 to -0.10). Similarly, the pipe run from ST MH-4 to ST MH-3 runs uphill (1.18 to 2.32). Please advise as to minimum required slope and whether or not a revised schedule will be required/provided to meet that slope. It is very hard to ascertain trench depths and encasement requirements without the proper elevations. Similar issues exist in both storm and sanitary piping.	
31	Please refer to Interior Metal Stairs, Specification Section 05512-7, Part 2, Paragraph C.1. It calls for treads and platforms to be 1-1/4 x 3/16 NAAMM Designation W-15-4. Structural Drawings S-450, 452, 459 and 460 (Stairs E & F and the roof access stair) show grating to be 2" in depth based on top of steel elevation to top of grating elevation. What is the correct depth of the grating?	See response to question 35. Maintain top of landings indicated and adjust grating depth as required to comply with specification section 05512-1.03 Performance Requirements.
32	We cannot identify or locate the ship ladder shown in Section A1/A406.00 (between Elevation 10.5 and Elevation 15.75). Where are they on the project?	Refer to drawing A-720 ENLARGED LIDDING AREA SECTION 1, upper left portion: Ship ladder shown on 1/A406 depicts detail for stair identified in detail callout D4-A531.
33	We cannot find elevation or details for five ship ladders between finger catwalks (Elevation 21.5) and transverse catwalk (Elevation 26.7) shown on A-115.01 & A-307.00.	See detail D4-A531 for stair elevation. See detail A1-A406 for stair section. See response to question No 33.
34	Drawing A-307.00 has the finger catwalk at Elevation 21.50 and a traverse catwalk at Elevation 26.70. Drawing A-720.00 looks to show the same area in section but the elevations are 22.75 and 28.00, respectively. What are the correct elevations?	Drawing A-307 is revised in Addendum 3. See Attachment E, Revisions to Drawings.
35	In Addendum #1, Question #8, it was asked to clarify whether the 4" LP piping was to be installed by Keyspan or the contractor. In response, a section of pipe on Drawing C-028 was highlighted as 2" HP pipe to be installed by Keyspan with trenching provided by contractor, but the remainder of the 4" pipe remained unchanged. On Drawing C-025.01, a note was added clarifying that Keyspan will install piping only up to the Gas Meter/Regulator, but the updated pipe on Drawing C-028 was located after the Gas	Drawing C-025.01 correctly shows the size of the HP gas line and limits of Keyspan's work. Drawing C-028.01 is revised by Addendum #3 to clarify the discrepancy. See Attachment E, Revisions to Drawings.

No.	Bidders' Questions	DDC Responses
	Meter/Regulator. Please clarify the discrepancy.	
36	<p>Reference: Bid Booklet, Contractor's Bid Schedule</p> <p>a. Which line item should the steel King Piles be included in?</p> <p>b. Please confirm the 850 lf of Marine Timber Piles for line item 22 refers to the Dolphin Pile.</p> <p>c. Which line item should the Rock Works be included in?</p> <p>d. Which line item should the fendering replacement/installation be included in?</p>	<p>a. Item 1m.</p> <p>b. Yes, the dolphin piles are included with Marine Timber Piles, line item 22.</p> <p>c. Item 1m.</p> <p>d. Item 1m.</p>
37	<p>Reference: Section</p> <p>a. HySecurity has two (2) HRG 220 ST models which meet the criteria of being suitable for a 16 foot wide gate panel. The HRG 220B will handle up to 1,600 lbs while the HRG 220C will handle up to 3,000 lbs. I don't know the weight of the gate or which of the models they are requiring – help.</p> <p>b. What is the location for the enclosure that houses the electric motor and hydraulic pump in relation to the operator? This is important because of the length of the hydraulic hoses.</p> <p>c. The standard enclosure for the pump and motor is NEMA-3R &amp; is NOT stainless steel. Stainless steel will be considerably more expense but if that is what is really wanted, I will get a price quote for it.</p> <p>d. Can they provide the model number for the fire department key switch assembly?</p>	<p>a. To obtain the weight of the gate, the supplier of the swing gate operators, specified in Section 02827, is required to coordinate with the supplier of the gates, specified in Section 02822.</p> <p>b. The location of the swing gate control enclosure is shown on Contract Drawing C-019.</p> <p>c. Provide specified enclosure.</p> <p>d. The manufacturer of the key switch assembly is not specified, as it is a fabricated item.</p>
38	<p>Note #1A on Drawing E-204 states that the contractor is to furnish and install all material, lab or and supervision for: the electrical installation within the blockhouse, including (4) 1000KVA transformer vaults and network protector compartment equipment complete with all devices and hardware. This would</p>	<p>Con Edison will furnish the (4) 1000KVA Transformer and network protector equipment to be installed by the contractor as indicated on Drawing E-342. Note 1A on Drawing E-204 states that the contractor is responsible for the material, labor and supervision required for the installation of the equipment that is supplied by</p>

No.	Bidders' Questions	DDC Responses
	include the transformers and network protector equipment and would be in conflict with the division of responsibility drawing E-342 stating that this equipment is to be provided by ConEdison. Historically, ConEdison is responsible for the furnishment of this equipment. Please confirm the correct scope for this work.	Con Edison.

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**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT B – REVISIONS TO ADDENDUM NO. 2**

**Bidder's questions and DDC Responses, Response to Question #27**

Revise "C-023" to read "C-028"

Specification Section 14696 Mooring Capstans, Page 19

Item 1: Revise to read as follows:

- "1. Page 14696-4, Part 2.02E.4: Revise "45 FPM single speed" to read "0-35 FPM variable speed".

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**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT C – ADDENDUM TO GENERAL CONDITIONS**

1. Page 16, Schedule B. In the line for Section 08342 – Overhead High Speed Fabric Doors Type 1, revise “Lifetime” to read “2 years for balance springs, mechanical and electrical components; five (5) years for door fabric”.

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**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT D – REVISIONS TO THE SPECIFICATIONS**

Specification Section 02222 Demolition and Removals, Page 02222-1

Part 1.01.B. After “marine piles” insert “, piles”.

Specification Section 02222 Demolition and Removals, Page 02222-6

Part 3.02.A. After “marine piles” insert “, piles”.

Specification Section 03300 Cast-in-Place Concrete, Page 03300-25

Part 2.02H.13: After “on exterior ramp structures” insert “and vehicle scales deck surfaces”.

Specification Section 08342

1. Page 08342-3, Part 1.08A.1.a: Revise this part to read as follows:

- “a. Door Type 1: Balance springs, mechanical and electrical components for two (2) years from date of Substantial Completion and door fabric for five (5) years from date of Substantial Completion.”

2. Page 08342-9

a. Part 2.03E.3: Revise this part to read as follows:

- “3. Automatic Mode Operation: The door shall be opened and closed automatically based on controls and sensors provided by the door supplier. A microwave-based vehicle detection system, installed to detect oncoming traffic, shall open the door. Photo-eyes, installed in the doorframes, shall close the door shortly after the vehicle passes through the door.”

b. Part 2.03F.3: Revise this part to read as follows:

- “3. Automatic Mode Operation: The door shall be opened and closed automatically, based on controls and sensors provided by the door supplier. Two microwave-based vehicle detection systems shall be installed to detect oncoming traffic on either side of the door. Either microwave detector, sensing a vehicle, shall open the door. The opposing microwave detector shall close the door after the vehicle passes through the door.”

3. Page 08342-10, Part 2.03G: Revise this part to read as follows:

- “G. Vehicle Detection: Vehicle detection shall be by a microwave-based detection system as shown. Door controller shall use microwave detector input to determine location of vehicle. Detection system shall include all power supplies, interposing relays, enclosures and appurtenances to comprise a complete operating system.”

Specification Section 09967 Coating for Steel Waterfront Structures

1. Page 09967-1, Part 1.02B: Delete this part in its entirety.



2. Page 09967-6, Part 2.01B: Revise this part to read as follows:

“B. Finish coating for steel fender panels and exterior ladders shall be an Epoxy-Polyamide system conform to:

1. System: SSPC PS 13.01
2. Paints: SSPC Paint 22
3. Color: Black

Ladder rungs shall additionally be coated with an ablative anti-fouling coating such as C-Flex 1-2-3 by Carboline Co. or approved equal. Color shall be red.”

Specification Section 10290 Bird and Pest Control

1. Page 10290-2, Part 2.01A.3: After this part, insert the following:

“4. Bird-X”

2. Page 10290-4, Part 2.02F: After this part, insert the following:

“G. Ultrasonic Bird Repeller

1. Product: Bird-X Model No. BB-PRO-110 or approved equal.
2. General Requirements
  - a. Provide bird repellents capable of controlling bird pests without harming them. Include a combination of distress cries, predator cries, harassments, and ultrasonic waves.
  - b. Include settings for delay periods, time of operation, and random operation.
  - c. Provide control boxes suitable for controlling four directional speakers. Provide speakers and control panels as shown on the Electrical drawing set, having the following adjustments:
    - (1) Volume: Ultrasonic sounds 95-102 dB at a distance of 1 meter, Sonic sounds 105-110 dB at a distance of 1 meter
    - (2) Frequency: Ultrasonic sounds 16-23 kHz, Sonic sounds 3-5 kHz
  - d. Provide speakers having a coverage area of 2,500 square feet and include 100 feet of wire per speaker.
  - e. Mount the control box in a NEMA 4X enclosure. The enclosure shall be constructed with molded fiberglass polyester and include a hinged window cover.
3. Electrical Requirements
  - a. Provide control panels with a 110VAC adapter to receive 120 volt power from a nearby convenience outlet.”

Specification Section 10881 Vehicle Scales, Page 10881-5

Part 2.01E.4: After this part, add the following:

- “a. Provide microsilica admixture for Class 50 DP bonded overlay in accordance with Section 03300.

Specification Section 13915 Fire-Suppression Piping, Page 13915-18

Part 2.09A.3.b: Revise this part to read as follows:

“Air Compressor: F-AIC-01 and F-AIC-02, UL Listed, fractional horsepower, 460-V ac, 60 Hz, three phase (NEMA 4X control Panel)”

Specification Section 13921 Electric-Drive, Centrifugal Fire Pumps

1. Page 13921-6, Part 2.02A.3: Revise “NEMA 12” to read “NEMA 4X”.

2. Page 13921-9, Part 2.02C.1: Revise “NEMA 12” to read “NEMA 4X”.

3. Page 13921-10, Part 2.04B: Revise “NEMA 12” to read “NEMA 4X”.

Specification Section 13953 Foam/Water Fire-Suppression System, Page 13953-6

Part 2.01B.1: Revise this part to read as follows:

“Pull stations for manual activation shall be compatible with release control plan and rated for NEMA 4X applications.”

Specification Section 14696 Mooring Capstans, Page 14696-4

Part 2.03C.2: Delete this part in its entirety.

Specification Section 15191 Diesel Fuel Piping, Page 15191-5

Part 3.01F: After this part, insert the following:

“G. All fuel lines inside the building shall be encased in reinforced concrete as shown and which conform to Sections 03100 – Concrete Forms and Accessories, 03200 – Concrete Reinforcement, 03300 – Cast-in-place Concrete, and ASTM C33 – Specification for Concrete Aggregates. Encasements shall contain no other services.”

Specification Section 15815 Duct Insulation, pages 15815-1 through 15815-8

In the footer of all pages, revise “Fans” to read “Duct Insulation”.

Specification Section 16411 Disconnect Switches, Page 16411-3

Part 2.02E: In the table, revise “Corrosive areas as defined in Section 16050 –Basic Electrical Materials and Methods or as shown” to read as follows:

“The Fire Pump Room and the corrosive areas as defined in Section 16050 – Basic Electrical Materials and Methods or as shown”

Section 16415 Automatic Transfer Switches, Page 16415-6

Part 2.06C: Revise this part to read as follows:

“Provide NEMA 4X enclosure and watertite “Meyers” hubs for conduit entries to ATS-2 located in the Fire Pump Room.”

Specification Section 16752 Digital Video System, Pages 16752-01 through 16752-31

Delete Section 16752 in its entirety and replace with new Section 16752, a copy of which is attached hereto.

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT E – REVISIONS TO THE DRAWINGS**

**REFER TO DRAWING C-003.01**

Add the following note to the drawing: "BATHYMETRY CONTOURS REFER TO THE FEET BELOW THE BROOKLYN BOROUGH DATUM, WHICH IS 2.547 ABOVE NGVD-29."

**REFER TO DRAWING C-017.02**

Revise spot elevation "5.74" above Con Ed Transformer Facility to read "6.00".

**REFER TO DRAWING C-016.01**

In three locations adjacent to building, revise spot elevation "6.86" to read "7.00".

**REFER TO DRAWING C-025.01**

Replace Drawing C-025.01 with Drawing C-025.02, a copy of which is attached hereto.

**REFER TO DRAWING C-026.01**

Replace Drawing C-026.01 with Drawing C-026.02, a copy of which is attached hereto.

**REFER TO DRAWING C-027.01**

1. Between ST MH-9 and the ramp drain, revise "12" ST" to read "18" ST".
2. In the bottom left coordinate grid delete the note reading "FOR CONTINUATION SEE PLUMBING DWGS".

**REFER TO DRAWING C-028.01**

Replace Drawing C-028.01 with Drawing C-028.02, a copy of which is attached hereto.

**REFER TO DRAWING C-030.01**

1. Replace the Storm Manhole Schedule with the following:

STORM MANHOLE SCHEDULE						
ITEM NO.	RIM CL. COORDINATES		RIM ELEV.	INLET INV. EL.	OUTLET INV. EL.	BRANCH INV. EL.
	N/S	E/W				
ST MH-1	153775.28	984856.89	6.25	1.09	1.09	10" PIER @ 2.00
ST MH-2	153812.74	984917.85	6.25	1.01	1.00	
ST MH-3	153764.09	984947.75	6.55	0.94	0.94	
ST MH-4	153845.91	985083.42	6.70	1.05	1.05	
ST MH-5	153901.35	985050.11	6.33	1.09	1.09	
ST MH-6	153955.08	985017.83	6.25	1.16	1.16	10" RD @ 1.75
ST MH-7	154009.61	984985.06	6.18	1.25	1.25	15" RD @ 2.00
ST MH-8	153671.59	984809.33	6.10	0.50	0.50	
ST MH-9	154103.18	984927.62	6.34	-0.63	-0.64	18" RAMP @ 1.37
ST MH-10	154331.36	984994.33	6.2	-0.44	-0.44	

ST MH-11	154237.28	984845.01	6.9	-0.82	-0.82	
ST MH-12	154095.78	984796.68	1.4	-0.56	-0.56	10" RD @ 1.44
ST MH-13	154028.91	984682.12	5.85	-0.72	-0.72	
ST MH-14	154001.89	984638.84	6.57	-0.76	-0.76	10" PIER @ 1.24
ST MH-15 *	153954.47	984652.04	11.5	-0.78	-0.78	
ST MH-16	154260.21	984843.62	6.92	-0.84	-0.84	

2. Replace the Catch Basin Schedule with the following:

CATCH BASIN SCHEDULE							
ITEM NO.	RIM CL. COORDINATES		TYPE	TOP OF GRATE	INLET INV. EL.	OULET INV. EL.	CONNECT TO
	N/S	E/W					
CB-1	153755.13	984835.73	2	5.29	1.15	1.09	ST MH-1
CB-2	153791.89	984895.56	2	5.34	1.07	1.01	ST MH-2
CB-3	153901.88	985036.39	2	5.77	1.11	1.09	ST MH-5
CB-4	153979.87	984988.68	2	5.77	1.24	1.16	ST MH-6
CB-5	154066.89	984934.94	2	5.72	-0.56	-0.63	ST MH-9
CB-6	154361.29	985054.91	1	5.71	-0.30	-0.44	ST MH-10
CB-7	154329.91	985004.75	1	5.70	-0.42	-0.44	ST MH-10
CB-8	154247.71	984926.32	2	5.75	-0.65	-0.82	ST MH-11
CB-9	154097.17	984809.82	2	5.70	-0.54	-0.56	ST MH-12
CB-10	154043.15	984722.46	2	7.52	-0.61	-0.72	ST MH-13

3. Replace the Sanitary Manhole Schedule with the following:

SANITARY MANHOLE SCHEDULE					
ITEM NO	RIM CL COORDIANATES		RIM ELEV.	INLET INV. EL.	OUTLET INV. EL.
	N/S	E/W			
SMH-1 *	153754.76	984796.9	5.8	1.81	1.79
SMH-2 *	153837.04	984746.39	11	1.19	1.16
SMH-3 *	153912.48	984700.07	11	0.59	0.57
SMH-4	153976.49	984660.77	6.45	0.11	0.08
SMH-5	154009.63	984638.45	6.56	-0.17	-0.33
SMH-6	154113.96	984809.08	6	-1.25	-1.27
SMH-7	154165.57	984893.53	6.2	-1.73	-1.75
SMH-8	154028.79	984978.17	6.15	-2.39	-2.54
SMH-9	153934.89	985035.37	5.95	-2.93	-2.94
SMH-10	153837.86	985093.8	6.57	-3.34	-3.36
SMH-11	153834.73	985137.31	6.85	-3.5	-3.55

**REFER TO DRAWING C-032.01**

Revise note "18" RCP STORM SEWER" to read "27" RCP STORM SEWER".

**REFER TO DRAWING C-033.01**

Revise note "18" RCP STORM SEWER" to read "27" RCP STORM SEWER".

**REFER TO DRAWING C-035.01**

1. Section 1/C-035, revise note "18" INLET INV EL 2.24' " to read "27" INLET INV EL 2.24" and note "18" OUTLET INV EL 2.24' " to read "27" OUTLET INV EL 2.24".
2. Section 3/C-035, revise note "18" INLET INV EL -0.79' " to read "24" INLET INV EL -0.79'" and "18" OUTLET INV EL -0.79' " to read "24" OUTLET INV EL -0.79".

**REFER TO DRAWING C-048.00**

1. Revise title of "ELECTRICAL HAND HOLE DETAIL" to read "ELECTRICAL MANHOLE DETAIL".
2. Revise Note 1 to read as follows:  
  
"1. PROPERTY LINE CUSTOMER MHS AND SECONDARY (UNSCRAMBLER) MHS (EMH-1a, EMH-1B, EMH-2A AND EMH-2) FOR INCOMING CON ED HIGH VOLTAGE SERVICE SHALL BE TYPE M11-6 MANHOLES INSTALLED IN ACCORDANCE WITH CON ED STANDARDS. (SEE CON ED DWG NO. 341185 FOR DETAILS).

**REFER TO DRAWING A-110.00**

1. Provide horizontal under slab insulation for the area defined by Column Lines A and C and 1 and 17
2. Provide horizontal under slab insulation for the area defined by Column Lines C and D and 6 and 17.
3. Provide horizontal under slab insulation for the area defined by the following spaces: storage, drum storage Electrical Room No. 1, BWAS Room and Odor Control Room.
4. Change room label for storage room between Column Lines 2 and 3 to "STORAGE 4".
5. Change room label for storage room between Column Lines 4 and 6 to "STORAGE 1".
6. Change room label for storage room between Column Lines 6 and 7 to "STORAGE 2".
7. Change room label for storage room between Column Lines 9 and 11 to "CRANE STORAGE".

**REFER TO DRAWING A-111.00**

1. Provide horizontal under slab insulation for the area defined by Column Lines A and C and 1 and 17.
2. Provide horizontal under slab insulation for the area defined by Column Lines C and D and 6 and 17.
3. Provide horizontal under slab insulation for the area defined by the following spaces: 114 storage - 115 storage - 116 storage - 117 storage - 118 drum storage - 120 electrical room No. 1 and 130 BWAS room.
4. Add 24" x 24" access hatch, with door swinging to the North, to Eastern wall of shaft in Room 101 located near Column A1.

5. Add 36" x 30" access hatch, with door swinging to the East, to South wall of shaft in Room 112 located near Eastern most wall of the Machine Shop Storage.
6. Add 36" x 30" access hatch, with door swinging to the West, to Northern wall of shaft in Room 104 located near Column B11.
7. Add 16" x 24" access hatch, with door swinging to the North, to Western wall of shaft in Room 109 located near Column A17.
8. Add room number "104" to room label Men's Lockers and Toilets located between Column Lines 4 and 6.
9. Change room label "MACHINE SHOP" to "MACHINE SHOP STORAGE".
10. Add note "CONCRETE PADS" to one of four rectangles shown on plan in HVAC Room 111.
11. Add note "LOCKERS TYP" with leader pointing towards 22 rectangles shown on plan between Column Lines 7 and 9 in Room 104.
12. Remove 10" dimension from Column Line 16 to the center of bollard at BWAS Room.
13. Add "10" TYP" dimension from outside corner of BWAS Room to the center of bollard.

**REFER TO DRAWING A-112.00**

1. Provide horizontal under slab insulation for the area defined by the following spaces: 114 storage - 115 storage - 116 storage - 117 storage - 118 drum storage - 120 electrical room No. 1 and 121 odor control room.
2. Add 24" x 30" access hatch, with door swinging to the South, to Western wall of shaft in Room 113 located near Door 113-2.
3. Remove "CJ" note from Room 113 along Column Line F.
4. Remove "CJ" note from Room 113 between Column Lines E and F.
5. Remove "CJ" note from center of Room 114.
6. Remove "CJ" note from wall in Room 121 near Column Line 12.
7. Remove 3'-8" dimension located to the north of Column F1.
8. Remove 2'-10" dimension located to the south of Column F1.
9. Remove 8'-7" dimension located to the south of Column E16.8.
10. Remove 4'-5" TO CTR LINE dimension string near Column F16.8.

**REFER TO DRAWING A-114.01**

1. Add 24" x 30" access hatch, with door swinging to the East, to Northern wall of shaft in Room 202 located near Column Line 17.

2. Add 36" x 30" access hatch, with door swinging to the South, to Western wall of shaft in Room 215 located near Column Line C.
3. Add Door Tag "211-1" to door along Column Line C in Room 211.
4. Add note "8" PERIMETER CURB / FLASHING C1/ A-521" in Room 201 with leader pointing towards wall at Column Line 1.
5. Remove 2" dimension from CMU wall along Column Line B.
6. Remove 10'-2" dimension from CMU wall along Column Line 14.
7. Remove 8 "CJ" notes to the north of Column Line C.
8. Remove 3'-6" dimension from Column C16.
9. Relocate note "FLOOR DRAIN SEE CONTRACT 4-P DRAWINGS" to drain along Column Line 6 between Column Lines C and D.

**REFER TO DRAWING A115.01**

1. Add 36" x 30" access hatch, with door swinging to the East, to South wall of shaft in Room 217 located near Eastern most wall of the Secure Storage Room.
2. Add 20'-2" dimension in Room 209 from west wall to Column Line 3.
3. Add 10'-8" dimension in Room 209 from Column Line 3 to shaft wall.
4. Add 5'-11 1/2" dimension in Room 209 from shaft wall to Eastern wall.
5. Remove Door Tag 210-1 from Vestibule B.

**REFER TO DRAWING A-116.00**

1. Replace room label "CORRIDOR" with "VESTIBULE C" in room to the East of Supervisor's office.
2. Replace room label "MENS TOILET" to the North of Vestibule C with "MENS TOILET 2".
3. Replace room label "WOMENS TOILET" to the North of Vestibule C with "WOMENS TOILET 2".
4. Replace room label "MENS TOILET" to the South of Vestibule C with "MENS TOILET 3".
5. Replace room label "WOMENS TOILET" to the South of Vestibule C with "WOMENS TOILET 2".

**REFER TO DRAWING A-117.0**

1. Add "6'-0" TYP" dimension to bollards outside the Supervisor's Office.
2. Add 36" x 30" access hatch, with door swinging to the North, to East wall of shaft in room 310 located near Northern most wall of Electrical Room #2.



3. Remove East to West wall with no wall hatch from Electrical Room.
4. Remove wall hatch from within the opening for door 310-2.
5. Remove 2'-4" dimension from Electrical Room.
6. Remove 10'-3" dimension from Electrical Room.

**REFER TO DRAWING A-118.00**

1. Add 36" x 30" access hatch, with door swinging to the East, to South wall of shaft in room 312 located near Eastern most wall of the Shaft.
2. Add label "STAIR E" to stair between column lines 3 and 5 in the Upper Lidding Room.
3. Add note "DN" with arrow pointing to the South at stair between doors 311-1 and 312-1.
4. Add "RAILING" note with leader pointing between "CHAIN" notes near Column Line 13.
5. Adjust leader on "CHAIN" note to point to line segment west of "PLATFORM" leader between Column Lines 13 and 15.

**REFER TO DRAWING A-119.00**

Add 36" x 30" access hatch, with door swinging to the South, to West wall of shaft on roof of Supervisor's Office located near the southern wall of the middle shaft space.

**REFER TO DRAWING A-121.00**

Replace word "CODUITS" with "CONDUITS" in note near Column C9.

**REFER TO DRAWING A-144.00**

Replace room label "FOREMAN'S OFFICE" with "SUPERVISOR'S OFFICE".

**REFER TO DRAWING A-151.00**

Replace room label "FOREMAN'S OFFICE" with "SUPERVISOR'S OFFICE".

**REFER TO DRAWING A-203.00**

1. Add detail callout "D2/A-504" at North end of translucent wall panel and canopy located at EL 39.50.
2. Add detail callout "D2/ A-504 OPP" to Southern end of Translucent Wall Panel and extending from EL 15.50 up to top of the Zinc Roof Canopy.

**REFER TO DRAWING A-220.00**

1. Add space label "INTERSTITIAL SPACE" above the corridor at EL 11.50 and below the loading level slab at EL 27.50, between Column Lines D and A.
2. Add detail call out "D2/A-502" at Column Line H.
3. Add detail call out "D1/A-501" at Column Line A.
4. Add detail callout "D2/ A-502" to Column Line H from EL 27.50 to crane power rail structure on roof.

5. Add detail callout "D1/ A-501" to Column Line A from EL 11.50 to above roof.
6. Remove note "INTERSTITIAL SPACE" from area above suspended ceiling in corridor between Column Lines C and B.

**REFER TO DRAWING A-221.00**

1. Add detail callout "D1/A-502" at Column Line H along the entire height of the wall.
2. Add detail callout "D1/A-502" to Column Line H from EL 27.50 to crane power rail structure on roof.

**REFER TO DRAWING A-300.00**

1. Add "6'-0" TYP" to bollards west of Supervisor's Office and north of Column Line D.
2. Replace room label "Corridor" with "VESTIBULE C" in room to the East of Supervisor's Office.
3. Replace room label "VESTIBULE" with "VESTIBULE D" for Room 306.

**REFER TO DRAWING A-303.00**

1. Change detail number "B3/A-303" to "C3/A-303".
2. Change detail name "TOILETS ELEVATION 5/A-303" to "TOILET STALL PARTITION DET".

**REFER TO DRAWING A-307.00**

1. Detail B1/A-307 Section 1, Stair E:
  - a. Replace "Replace "SERVICE CATWALK EL+39.00" text to read SERVICE CATWALK EL +38.42.
  - b. Replace "T/LANDING EL 33.63" text to read T/LANDING EL 33.33.
  - c. Replace dimension text "10'-9 3/16"" between elevations 25.25 and 39.00 to read 10'-2".
  - d. Replace dimension text "5'-4 5/8"" between El 28.25 and El 33.63 to read 5'-1".
  - e. Replace dimension text "5'-4 5/8"" between El 33.63 and El 39.00 to read 5'-1".
2. Detail B2/A-307 Stair E Plan at El 11.00:
  - a. Replace "STAIR E PLAN AT EL 11.00" text to read STAIR E PLAN AT EL 11.50.
  - b. Replace dimension text "12 EQ TREADS" to read 13 EQ TREADS.
3. Detail B3/A-307 Enlarged Lidding Area Plan, EL 27.75, 26.20
  - a. Replace "ENLARGED LIDDING AREA PLAN, EL 27.75, 26.20" text to read ENLARGED LIDDING AREA PLAN, EL 28.25, 26.70.
  - b. Replace "T/LANDING EL 27.25" text to read T/LANDING EL 28.25.
  - c. Replace dimension text "12 EQ TREADS" to read 13 EQ TREADS.
4. Detail B4/A-307 Stair E Plan at El 37.91:
  - a. Replace "STAIR E PLAN AT EL 37.91" text to read STAIR E PLAN AT EL 38.42.
  - b. Replace "8 EQ. TREADS" text to read 9 EQ. TREADS.
5. Detail D2/A-307 Enlarged lidding area plan, EL 27.50, 26.20
  - a. Replace "ENLARGED LIDDING AREA PLAN, EL 27.50, 26.20" text to read ENLARGED LIDDING AREA PLAN, EL 28.25, 26.70.
  - b. Replace "T/LANDING EL 28.00" text to read T/LANDING EL 28.25.

6. Drawing A-307.00 detail D4/A-307 Section 2 Stair F:
  - a. Replace "PIER LEVEL LANDING" TEXT EL 12.25 to read PIER LEVEL LANDING TEXT EL 11.50.
  - b. Replace "T/LANDING EL 20.63" to read T/LANDING EL 19.875.
  - c. Replace "LANDING LEVEL EL 29.00" to read LANDING LEVEL EL 28.25.

**REFER TO DRAWING A-400.00**

Remove 4'-0" dimension and wall outline beyond in Detail D4/A-400 and replace with concrete curb and typical 42" guardrail.

**REFER TO DRAWING A-405.00**

1. Add detail callout "D3/ A-406" to detail C4/A-405 at base of ship ladder and T/ Mezzanine.
2. Add Concrete Curb with 42" guardrail beyond to detail C4/ A-405.

**REFER TO DRAWING A-406.00**

Remove CMU from detail D3/ A-406 and replace with Concrete to match shaft wall below.

**REFER TO DRAWING A-500.00**

1. Remove additional Y from the word "Sprayed" in the Sprayed fire resistive materials notes.
2. In Note 1.B, delete "PROVIDE BOND BEAMS ON TOP OF ALL INTERIOR WALLS W/2#5 REINF"
3. Delete Note 3.

**REFER TO DRAWING A-501.00**

In Detail D1 after "See structural for additional information" insert the text "Extend vertical insulation from underside of slab to min 24 inches below grade line".

**REFER TO DRAWING A-554.00**

Replace Drawing A-554.00 with Drawing A-554.01, a copy of which is attached hereto.

**REFER TO DRAWING A-601.00**

1. At the upper-right of the drawing, delete the D3 detail entitled "RATED WALL UNDER METAL DECK"
2. For detail D3 located at the bottom-middle of the drawing, revise the title "WALLS AT ANCHOR POINTS" to read "TOP OF WALL UNDER METAL DECK".

**REFER TO DRAWING S-110.00**

Just above column line E and between column lines 7 and 9, delete the label "EL 11.00".

**REFER TO DRAWING S-410.00**

Replace Drawing S-410.00 with Drawing S-410.01, a copy of which is attached hereto

**REFER TO DRAWING S-452.01**

1. In Section 5/S-450, replace the elevation label for the roof access catwalk that reads "T/C10 EL 76.67" to read "T/C10 SEE NOTE 2".

2. In the general sheet notes at the bottom of the sheet, after Note 1, add the following

“2. TOP OF STEEL ELEVATION AT STAIR LANDINGS SHALL BE COORDINATED WITH THICKNESS OF STEEL GRATING.”

**REFER TO DRAWING S-458.00**

1. In PARTIAL PIER LEVEL PLAN, replace the elevation label for the Stair E landing that currently reads “T/LANDING EL 19.75” with “T/LANDING EL. 19.875”.
2. In Section 1/S-458:
  - a. Replace the elevation label at the upper intermediate landing that currently reads “T/C10 EL 33.17” with “T/C10 SEE NOTE 2”.
  - b. Replace the elevation label at the lower intermediate landing that currently reads “T/GRATING EL 19.75” with “T/GRATING EL 19.875”.
  - c. Replace the elevation label at the lower intermediate landing that currently reads “T/C10 EL 19.58” with “T/C10 SEE NOTE 2”.
3. In Section 2/S-458:
  - a. Replace the elevation label at the landing that currently reads “T/GRATING EL 19.75” with “T/GRATING EL 19.875”.
  - b. Replace the elevation label at the landing that currently reads “T/C10 EL 19.58” with “T/C10 SEE NOTE 2”.
4. In Detail 3/S-458:
  - a. Delete the elevation label that reads “T/GRATING EL 33.33”.
  - b. Delete the elevation label that reads “T/C10 EL 33.17”.
5. In the general sheet notes at the bottom of the sheet, after Note 1, add the following “2. TOP OF STEEL ELEVATION AT STAIR LANDINGS SHALL BE COORDINATED WITH THICKNESS OF STEEL GRATING.”

**REFER TO DRAWING S-459.00**

1. In Detail 1/S-458:
  - a. Replace the note beneath the detail title that currently reads “T/STEEL EL 19.58 UNLESS NOTED THUS ( )” with “T/STEEL EL SEE NOTE 2”.
  - b. Replace the note beneath the detail title that currently reads “T/GRATING EL 19.75 UNLESS NOTED THUS ( )” with “T/GRATING EL 19.875 UNLESS NOTED THUS ( )”.
2. In Detail 2/S-458, replace the note beneath the detail title that currently reads “T/STEEL EL 33.17 UNLESS NOTED THUS ( )” with “T/STEEL EL SEE NOTE 2”.
3. In Detail 6/S-458, 460:
  - a. Replace the elevation label at the landing that currently reads “T/GRATING EL 19.75” with “T/GRATING EL 19.875”.
  - b. Replace the elevation label at the landing that currently reads “T/C10 EL 19.58” with “T/C10 SEE NOTE 2”.
4. In the general sheet notes at the bottom of the sheet, after Note 1, add the following “2. TOP OF STEEL ELEVATION AT STAIR LANDINGS SHALL BE COORDINATED WITH THICKNESS OF STEEL GRATING.”

**REFER TO DRAWING S-460.00**

1. In PARTIAL PIER LEVEL PLAN, replace the elevation label for the Stair F landing that currently reads "T/LANDING EL 19.75" with "T/LANDING EL. 19.875".
2. In Section 1/S-460:
  - a. Replace the elevation label at the intermediate landing that currently reads "T/GRATING EL 19.75" with "T/GRATING EL 19.875".
  - b. Replace the elevation label at the intermediate landing that currently reads "T/C10 EL 19.58" with "T/C10 SEE NOTE 2".
3. In Section 2/S-460:
  - a. Replace the elevation label at the landing that currently reads "T/GRATING EL 20.50" with "T/GRATING EL 19.875".
  - b. Replace the elevation label at the landing that currently reads "T/C10 EL 19.58" with "T/C10 SEE NOTE 2".
4. In Detail 3/S-460:
  - a. Replace the note beneath the detail title that currently reads "T/STEEL EL 19.58 UNLESS NOTED THUS ( )" with "T/STEEL EL SEE NOTE 2".
  - b. Replace the note beneath the detail title that currently reads "T/GRATING EL 19.75 UNLESS NOTED THUS ( )" with "T/GRATING EL 19.875 UNLESS NOTED THUS ( )".
5. In the general sheet notes at the bottom of the sheet, after Note 1, add the following "2. TOP OF STEEL ELEVATION AT STAIR LANDINGS SHALL BE COORDINATED WITH THICKNESS OF STEEL GRATING."

**REFER TO DRAWING S-802.01**

On the "RUBBER FENDER DETAILS":

1. On the left side of the "FRONT VIEW" detail delete the notation "1 ¼" S.S. FENDER BOLTS (14 REQUIRED), PROVIDE W/ WASHERS & DOUBLE NUTS" and replace with "BOLT LOCATION (TYP.)".
2. On the right side of the "ELEVATION" detail change "5/8" DIA. A307 BOLT..." to "1- ¼" DIA A307 BOLT...".

**REFER TO DRAWING M-131.00**

Replace Drawing M-131.00 with Drawing M-131.01, a copy of which is attached hereto

**REFER TO DRAWING M-133.00**

Replace Drawing M-133.00 with Drawing M-133.01, a copy of which is attached hereto

**REFER TO DRAWING M-511.00**

For the capstan block diagram, add a speed control operator to the vendor-supplied start/stop push button station.

**REFER TO DRAWING M-514.00**

Replace Drawing M-514.00 with Drawing M-514.01, a copy of which is attached hereto

**REFER TO DRAWING M-640.01**

In the "SPECIFICATION REFERENCE" column for Sign Numbers 4 through 23, revise "SECTION 10410 - INTERIOR SIGNS" to read "SECTION 10440 - INTERIOR SIGNS".

**REFER TO DRAWING P-202.00**

Under Sprinkler System Design Criteria, Add the following note to the drawing:

10. PROVIDE INTERMEDIATE OR HIGH TEMPERATURE RATED SPRINKLERS FOR SPRINKLERS LOCATED NEAR UNIT HEATERS AND OTHER HEAT SOURCES PER NFPA 13."

**REFER TO DRAWING E-105.01**

1. Change the hp of F-VES-1A from 5 to 0.5.
2. Revise note 1 to read "FOR GROUNDING CONNECTION REFER TO DRAWING E-311."

**REFER TO DRAWING E-106.01**

Replace Drawing E-106.01 with Drawing E-106.02, a copy of which is attached hereto.

**REFER TO DRAWING E-110.01**

Remove the contact closure cabinet and its associated notes from the INBOUND TRUCK DOOR (F-OHD-01) BLOCK DIAGRAM and replace with a MICROWAVE VEHICLE SENSOR.

**REFER TO DRAWING E-113.01**

1. Add a connection to the PURGE PANEL F-PSP-01 BLOCK DIAGRAM to F-DCP-01 with a conduit tag of C7.
2. Add Note 2 as follows:  
  
"2. ON THIS DRAWING, A DOTTED LINE ENCLOSURE INDICATES A COMPONENT OR COMPONENTS IN A COMMON DEVICE.

**REFER TO DRAWING E-202.00**

Revise the tag that reads "4#8 & 1#8G, 1"C" to read "4#8, 1#8G, 1-1/4"C".

**REFER TO DRAWING E-203.00**

Replace Drawing E-203.00 with Drawing E-203.01, a copy of which is attached hereto

**REFER TO DRAWING E-305.01**

1. Revise the tag that reads "CONTAINER READY LIGHT (TYP) SEE NOTE 9" to read "CONTAINER READY LIGHT (TYP) SEE NOTE 10".
2. Add Note 10 as follows:  
  
"10. CONTAINER READY LIGHT FURNISHED BY CONTAINER LIDDING SYSTEM SUPPLIER."

**REFER TO DRAWING E-306.01**

Replace Drawing E-306.01 with Drawing E-306.02, a copy of which is attached hereto.

**REFER TO DRAWING E-307.01**

Replace Drawing E-307.01 with Drawing E-307.02, a copy of which is attached hereto.

**REFER TO DRAWING E-314.01**

Replace Drawing E-314.01 with Drawing E-314.02, a copy of which is attached hereto.

**REFER TO DRAWING E-315.01**

Replace Drawing E-315.01 with Drawing E-315.02, a copy of which is attached hereto.

**REFER TO DRAWING E-318.00**

Replace Drawing E-318.00 with Drawing E-318.01, a copy of which is attached hereto.

**REFER TO DRAWING E-351.01**

Remove the hanging line near intersection of lines 14 and (between E and F).

**REFER TO DRAWING E-354.01**

Replace Drawing E-354.01 with Drawing E-354.02, a copy of which is attached hereto.

**REFER TO DRAWING E-504.00**

1. Remove the Emergency Cut-off for the fueling system power supply.
2. Add an Addressable Relay for F-VES-01 near lines F and 16.8.

**REFER TO DRAWING E-508.01**

1. Remove the addressable relay for F-VES-01 on the SLC CLASS "A" loop on the tipping floor.
2. Add text near the power for the FCO Panel as follows, "SEE DWG E-319 FOR DETAILS".

**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT F – REVISIONS TO THE BID BOOKLET**

1. Delete Special Experience Requirements pages 3, 3a in the Bid Booklet and replace with revised pages 3-R, 3a-R, included with this Addendum.



## SPECIAL EXPERIENCE REQUIREMENTS

Special Experience Requirements apply as indicated below.

Bidder:	General Construction	<u>  X  </u>	YES	<u>      </u>	NO
Specific Areas of Work:	General Construction	<u>  X  </u>	YES	<u>      </u>	NO
	Plumbing Work	<u>      </u>	YES	<u>  X  </u>	NO
	HVAC Work	<u>      </u>	YES	<u>  X  </u>	NO
	Electrical Work	<u>      </u>	YES	<u>  X  </u>	NO
Manufacturers:	General Construction	<u>  X  </u>	YES	<u>      </u>	NO
	Plumbing Work	<u>      </u>	YES	<u>  X  </u>	NO
	HVAC Work	<u>      </u>	YES	<u>  X  </u>	NO
	Electrical Work	<u>      </u>	YES	<u>  X  </u>	NO

(A) **EXPERIENCE REQUIREMENTS FOR THE BIDDER:** The special experience requirements set forth below apply to the bidder indicated above. Compliance with such special experience requirements will be determined solely by the City prior to an award of contract. Failure to comply with the special experience requirements will result in the rejection of the bid as non-responsive.

- (1) The bidder must, within the last seven (7) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least one (1) large construction project involving the following areas: (1) marine construction (for example, dredging, bulkheads, gantry crane systems), (2) highway ramp construction, (3) construction of underground utilities (such as sanitary and storm sewers, high pressure gas lines, power distribution) and (4) heavy building construction. A large construction project, for the purposes of this definition shall mean a project of at least One hundred million (\$100,000,000.00) Dollars. The bidder may submit more than one project to demonstrate experience in the specified areas, however, at least one of those projects must have a value of at least One hundred million (\$100,000,000.00) Dollars.

(B) **QUALIFICATION FORM:** For each project submitted to demonstrate compliance with the special experience requirements, the bidder must complete the Qualification Form included in the Bid Booklet. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

(C) **CONDITIONS:** The City may, in determining compliance with the special experience requirements set forth above, consider prior projects completed by principal(s) or other employees of the bidder while affiliated with another entity, subject to the conditions set forth below.

- (1) Any principal or other employee on whose prior experience the bidder is relying to demonstrate compliance with these special experience requirements must have held the following: (a) a significant management role in the prior entity with which he/she was affiliated, and (b) a significant management role in the entity submitting the bid for a period of six months or from the inception of the bidding entity. If the bidder is relying on the prior experience of a principal or employee, it must submit documentation confirming the position held by such principal or employee in the prior entity, as well as in the bidding entity.
- (2) The bidder may not rely on the experience of its principals or other employees to demonstrate compliance with any other requirements, including without limitation, financial requirements or requirements for a specified minimum amount of annual gross revenues.

(D) **JOINT VENTURES:** In the event the bidder is a joint venture, at least one firm in the joint venture must

meet the above described experience requirements.

- (E) **EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK:** The special experience requirements set forth below apply to the contractor or subcontractor that will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor that will perform these specific areas of work. If the bidder intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the bidder intends to subcontract these specific areas of work, its proposed subcontractor(s) must demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City. The bidder is advised to carefully review these special experience requirements prior to submitting its bid, as such experience requirements will be strictly enforced.

- (1) Special experience requirements apply to the contractor or subcontractor that will perform specific areas of work specified in the section(s) set forth below.

General Construction

- (a) Section 07610: Sheet Metal Roofing

- (2) Special experience requirements applicable to the contractor or subcontractor that will perform specific areas of work are summarized below. Such experience requirements are set forth in full in the Addendum to the General Conditions.

- (a) The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition, the contractor or subcontractor must be licensed, certified or approved by the manufacturer.

- (3) For each project submitted to demonstrate compliance with the special experience requirements for specific areas of work, the contractor or proposed subcontractor will be required to complete the Qualification Form included in the Bid Booklet. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

- (F) **EXPERIENCE REQUIREMENTS FOR MANUFACTURER(S):** The special experience requirements set forth below apply to the manufacturer that will supply or fabricate specific material or equipment. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of award, the contractor will be required to submit the qualifications of the proposed manufacturer(s). Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.

- (1) Special experience requirements apply to the manufacturer(s) of material and/or equipment specified in the section(s) set forth below.

General Construction

- (a) Section 07610: Sheet Metal Roofing

- (2) Special experience requirements applicable to the manufacturer(s) of specified material or equipment are summarized below. Such experience requirements are set forth in full in the Addendum to the General Conditions.

- (a) The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.

**Section 16752**  
**DIGITAL VIDEO SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Provide a complete digital video system. The system shall include all necessary workstations, software, digital video recording equipment, cameras, IP Encoders, IP Decoders, command consoles, equipment racks, networking switching hardware, and real-time video monitoring equipment, power supplies, conduit, cable and accessories for a complete operational digital video system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01821 - Training
- B. Section 16050 - Basic Electrical Materials and Methods
- C. Section 16121 - Wires and Cables - 600 Volts and Below
- D. Section 16130 - Electrical Raceway Systems
- E. Section 16264 - Uninterruptible Power Supplies
- F. Section 16511 - Lighting
- G. Section 16723 - Fiber Optic Cable

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code
  - 3. ONVIF - Open Network Video Interface Forum

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data as stated in the specifications.
- C. Shop Drawings: Furnish shop drawings for the digital video system including the following:
  - 1. Furnish Documentation of qualification of integrators and installers meeting the criteria of section 1.07 QUALIFICATIONS.

2. Furnish wiring diagrams for assemblies that show connections to electrical power and communication. Clearly differentiate between shop-installed portions of wiring and field installed portions.
3. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.
4. Furnish front elevations of panels and racks showing space allocation of equipment.
5. Furnish building floor plan and equipment room layouts showing cable and conduit routing and space allocation of equipment.
6. Provide system narrative that explains the proposed devices work together to meet the requirements within the specification. Explain how the software will be set up for operations.

#### 1.05 REFERENCE ABBREVIATIONS

A. This specifications references abbreviations in accordance with the following list:

- |     |       |   |   |
|-----|-------|---|---|
| 1.  | DVA   | - | Digital Video Appliances                              |
| 2.  | DVR   | - | Digital Video Recording                               |
| 3.  | DVRS  | - | Digital Video Monitoring Recording and Storage System |
| 4.  | DVS   | - | Digital Video Server                                  |
| 5.  | GUI   | - | Graphical User Interface                              |
| 6.  | LAN   | - | Local Area Network                                    |
| 7.  | MOD   | - | Minimum object distance                               |
| 8.  | NTSC  | - | National Television System Committee                  |
| 9.  | NTU   | - | Network Terminal Unit                                 |
| 10. | NDVMS | - | Network Digital Video Management System               |
| 11. | PTZ   | - | Pan, Tilt & Zoom                                      |

#### 1.06 SYSTEM DESCRIPTION

- A. This section specifies the minimum requirements for a Digital Video Monitoring, Recording and Storage System (DVMRS).
- B. The DVRS shall have the capability to scale to accommodate a minimum of 100 cameras installed strategically throughout the MTS site. The majority of the installed cameras will be placed indoors with a certain number of additional cameras to be installed outdoors. The system will support both fixed and PTZ cameras as outlined in the engineering drawings.

## 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.
- C. Integrator: Authorized certified integrator and installer of Digital Video server

## 1.08 WARRANTY

- A. Furnish a written 3-year minimum warranty covering software, and all equipment associated with the digital video system including parts and labor from the digital video system manufacturer.

## 1.09 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. One of each type of camera provided
  - 2. One of each type of lens provided.
  - 3. One type of each type of converter, network terminating units, midspan
  - 4. One type of each type of camera housing
  - 5. Twenty percent but not less than two, of each type of power supply.
- B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Camera and Accessories
    - a. Axis Communications
    - b. Bosch Security Systems
    - c. Sony Corporation

2. Digital Video Servers
  - a. GENETEC, Inc. – Omnicast
  - b. Milestone
  - c. Salient Systems
  - d. OnSSI
3. Ethernet Media Converters/Fiber Optic Transmitters and Multiplexers
  - a. Allied Telesis
  - b. IFS (Interlogics/UTC/GE)
  - c. Siquira
4. Equipment Racks
  - a. Provide Equipment racks that meet the requirements of Division 16 section "Telephone and Data Systems."
5. Network Switch
  - a. Provide Equipment racks that meet the requirements of Division 16 section "Telephone and Data Systems."
6. Industrial Monitors
  - a. Allen Bradley
  - b. VarTech Systems Inc.

2.02 GENERAL STANDARDS

- A. All equipment and materials used shall be standard components that are regularly manufactured and utilized in the manufacturer's system.
- B. All equipment and components used shall have been thoroughly tested and proven in actual use.
- C. All equipment and components used shall be CE-marked and FCC-certified.
- D. All systems and components shall be provided with the availability of a toll-free (US and Canada), technical assistance program (TAP) from the manufacturer. The TAP shall allow for immediate technical assistance for either the dealer/integrator/installer or the City at no charge.
- E. Each dealer/integrator/installer and DSNY shall have access to a password-protected e-support Web site for Web-based technical assistance on a 24-hour basis. This site will enable downloads of software updates, manuals, review of frequently asked questions, and generation of service tickets with a 24-hour maximum response time.

- F. All systems and components shall be provided with a three working days turnaround repair express and 24-hour parts replacement. The repair and parts express service shall be guaranteed by the manufacturer for warranty and non-warranty items.

## 2.03 DIGITAL VIDEO RECORDING SYSTEM MANAGEMENT

### A. Digital Video Recording System Configuration

#### 1. General

- a. The DVMRS shall be configured to provide a minimum of 30 days of video archival, stored automatically on hard drive disks. The storage requirement for this system shall be based on a configuration where the all cameras, will be on a recording video schedule initially set for 24 hours per day, Monday through Sunday.. The storage system should be expandable.
- b. The IP based compressed signals will be transmitted into a Network switch. The Digital Video Recorder units will receive the data streams directly from the Network Switch via TCP/IP transmission protocols. The Digital Video Recorder units will then take the compressed video signal and store the video using internal hard drives for archival storage. The Digital Video Appliances shall offer the ability to leverage multiple quality settings (Low, Medium and High).
- c. Recorders and servers shall consist of rack-mountable PCs connected to the Local Area Network (LAN).
- d. Video and other data managed by the DVRS shall be accessible from the workstation PCs connected directly to the LAN.
- e. The DVMRS shall include Graphical User Interface (GUI) based client server software Suite designed to run on PC workstations running the latest version of Microsoft Windows Professional operating system.
- f. The DVMRS GUI software functions shall include specific software applications within the software Suite that shall include; System Setup and Administration, Live Monitoring, Live and Recorded video retrieval with PTZ camera control, Video playback; Video export, Robust alarm Global monitoring, and other capabilities as described below.

2. Compatibility with Digital Video Cameras: The DVRS shall work with a wide variety of IP Cameras. The Digital Video Recorders will utilize a standard Ethernet connection for video input via TCP/IP transmission



protocols. The DVRS shall be fully scalable to accommodate future camera recording and video management up to 100 cameras.

3. Storage: The DVRS shall be capable of supporting unlimited video storage capacity by offering a hardware architecture that is scalable and configurable to allow external devices such as AIT Tape Libraries or SANS storage devices to be added in the future.
4. Workstations: The DVRS shall be a distributed, multi-user, multi-tasking system capable of supporting simultaneous request from multiple workstations for video call-up and Alarm monitoring.
5. Video Recording Tasks: The DVRS shall be capable of the following tasks:
6. Simultaneous Tasks: The DVR units shall be capable of performing multiple tasks simultaneously, and within practical limits no task shall interfere with any other task. The DVR units shall prioritize tasks so that recording and alarm processing will continue uninterrupted regardless of any number of requests being received from workstations at any given time. DVR units shall be capable of performing the following tasks simultaneously:
  - a. Recording Tasks
    - (1) Storing video to internal hard drives for storage.
    - (2) Maintain an accurate index of video files stored on local disks.
    - (3) Delete older files as needed to free up space to record newer video clips.
    - (4) Be able to selectively transfer recorded video to long-term storage media upon request, automatically if necessary.
  - b. Alarm Tasks
    - (1) Execute video image analysis algorithms including activity detection and video loss detection as well as providing detailed alarm messages.
    - (2) Alarm messages shall allow for priority color-coding of specific cameras and audible audio notification output for all cameras if required.
    - (3) Sending alarm messages to the server or workstation for proper management of alarm responses.

- (4) Processing alarm response instructions including calling camera presents, changing recording modes, and controlling alarm relay outputs.
  - c. Workstation Tasks
    - (1) Supplying one or more live video streams with a maximum of 64 live streams of video in the Software GUI.
    - (2) Support up to 16 windows of Live and Recorded video streams in the software GUI at the same time for review.
    - (3) Enabling one or more users to play back previously recorded video, including "Instant Replay" of video recorded within the last few seconds of video capture.
    - (4) Sending real-time commands to PTZ cameras for live camera control.
7. Recording Modes: DVR units shall support the following recording modes:
  - a. Continuous Recording: DVRS shall be capable of recording 24 hours a day, 7 days a week on a full time recording schedule.
  - b. Scheduled Recording: Establish a recording schedule for each camera based on hours of the day and days of the week including recorder settings such as frame rate, resolution, bandwidth and quality settings.
  - c. Alarm Recording: Enable the System Administrator to define alarm responses including:
    - (1) Instructions to trigger recording of specified cameras at specified frame rates and quality settings. Alarm responses to include the following recording capabilities:
      - (a) Start recording cameras not currently being recorded.
      - (b) Supplement continuous or scheduled recording by changing the recording mode or triggering recording of the same camera on a different recorder in a different video format.
      - (c) Selectively copy video to long-term storage media upon alarm.
    - (2) System Administrators shall determine whether video will be retained on long-term storage media for each continuous or

scheduled recording instruction. Automatically retain video on long-term storage media when video is recorded as a part of a defined response to an alarm event.

- d. On Demand Recording: The DVRS shall allow authorized users to stop and start recording from within the GUI application software.

8. Workstation Software

- a. Multi-Tasking: GUI application software shall enable users to manage multiple windows and perform multiple tasks simultaneously, including the following:

- (1) Monitoring progress as one or more video clips are retrieved from a long-term storage media and made ready for playback.
- (2) Allow for scheduling of clips to be downloaded at a specific time for a specific authorized end user.
- (3) Exporting video to digital media or to an analog output device for permanent, long term storage or investigative usage.

9. Video Window Layouts: Users shall be able to select from the following video window layouts with live or recorded video:

- a. Single Camera view – 1 camera displayed in the entire GUI workspace.
- b. Quad camera view – 4 cameras arranged in two rows of two individual windows displayed in the entire GUI workspace.
- c. Three by Three (3 x 3) – 9 total cameras arranged in three rows of three individual windows displayed in the entire GUI workspace.
- d. Four by Four (4 x 4) – 16 total cameras arranged in four rows of four individual windows displayed in the entire GUI workspace.
- e. Free: Open, move and size multiple independent video windows as needed in a tile or cascade layout.

10. Aspect Ratio: The software shall ensure that the ratio of the width and height of the displayed video images always matches the ratio that was originally captured regardless of the size of the video window.

11. Zoom: During viewing of live and/or recorded video, the GUI shall allow the user to select an area of interest and zoom in without pausing the video.

12. Image Toolkit: When viewing live or recorded video, the software shall provide functions to work with an individual video image in a paused video window including the following capabilities:
  - a. Print the image to any standard PC based printer.
  - b. Save the image to a common image file format. Image file formats shall include, but not be limited to: .JPG, .BMP, .PSD, Tiff and Targa.
  - c. Copy the image to a clipboard so the image can be pasted into any PC based software application.
  - d. Adjust the brightness and/or contrast of the image.
  - e. Convert the image from color to grayscale.
  - f. Apply filters to the image to de-speckle, smooth, or sharpen the image.
  - g. Apply edge detection to highlight borders or surfaces of objects within the image.
  - h. Add the date and time onto the image.
  - i. Add descriptive text annotation onto the image.
13. Processing Video Requests: When a user submits a video request, the DVRS shall automatically perform whatever tasks are necessary to make the requested video available for playback, regardless of the video storage location.
14. Multiple Video Requests and Video Clips: The DVRS shall enable users to submit and manage multiple requests for video in the following fashion:
  - a. The GUI organizes video requests in a tree structure to maintain the hierarchical relationship between video requests and corresponding video clips.
  - b. Use icons and text to indicate status of requests and video clips.
  - c. The GUI shall list cameras in the group and show a separate video clip icon for each camera, if a request is based on a group of cameras.
  - d. The GUI shall show every available video clip that matches the video request when a camera recorded in more than one video format by more than one recorder at a requested time.

- e. The GUI shall facilitate viewing video clips from a sequence of camera views. For example, clips showing a subject walking through a facility or a package moving along a conveyer belt.
  - f. The GUI to enable the user to use drag-and-drop to re-order the video clips within a group to create the desired sequence of cameras.
  - g. Include a GUI hotkey to open the next video clip in sequence. A function to pause playback in the current video window and open the next video clip in sequence in a new video window. The next video clip shall be positioned to the same time where the previous video clip paused, and the next video clip shall start playing automatically. By pressing the "Next Video Clip" hotkey each time the subject is leaving the camera view, the user can conveniently follow the subject or object through the sequence of video clips.
  - h. The DVRS shall support time-synchronized playback of recorded video on up to 16 windows simultaneously.
15. Controlling Video Playback: After opening a video window to play back a video clip, the GUI shall enable a user to control all aspects of playback.
- a. Playback Controls
    - (1) Single button to start and stop video playback.
    - (2) Single button to step forward or backward through the video in single time increments.
    - (3) Single button to step forward or backward through the video in single frame increments.
    - (4) Single button to step forward or backward through the video in multiple frame increments.
    - (5) Single button for moving through the video frames in Reverse playback mode.
    - (6) The ability to cause the video to loop continuously through a recorded video clip segment.
  - b. Positioning Controls: Slider bars and buttons to quickly and conveniently position to the beginning, end or any other time period within the video clip.
  - c. Speed Control: The DVRS shall incorporate a slider bar to control the rate of playback. Enable the user to select playback speeds that are

slower than, equal to, faster than the rate at which the video was originally recorded.

16. Scanning Recorded Video for Activity: The DVRS shall provide a function to rapidly process video clips and locate images with activity. Activity scanning provides an intelligent substitute for manual "fast forward" and scanning including the following:

- a. Enables the user, through the GUI, to specify a scanning interval to control the percentage of recorded images that will be checked for activity.
- b. Provide a GUI function to enable the user to select one or more areas of interest and/or adjust the sensitivity for those scanned areas.
- c. When activity is detected, the GUI will display a thumbnail of the corresponding video image with a timestamp. The sequence of thumbnails will provide high level overview of the activity in the video clip, allowing the user to make a quick assessment of whether further review is warranted.
- d. Support Multi-tasking of other investigative functions while Activity Scanning.
- e. Click on a thumbnail to position the video for the user in the GUI while scanning is still in progress.
- f. Support video playback of the related clip and/or unrelated clips while scanning is in progress.

17. Requesting Live Video

- a. The GUI shall enable the user to open live video windows by using the mouse to drag a camera or group of cameras from the camera tree directly into the video window area of the application window.
- b. The GUI shall enable users to view live video from multiple DVR units and sites simultaneously.

18. Controlling Live Video Windows

- a. Live video windows shall be consistent with video playback windows in appearance and operation.
- b. Live video windows shall maintain a cache of recent images. Enable the user to pause live video and quickly review recent images, then resume live video.

**B. System Monitoring and Problem Notification**

1. The DVRS shall monitor each system component, and generate system alert messages to notify system administrators of any component, and generate system alert messages to notify system administrators of any component that is not operating normally.
2. Provide a normally open dry contact that closes when any alarm occurs to activate a "Trouble Alarm" at SCADA.

**C. Security:** The DVRS shall include login security to control the following functions available to each system user:

1. Grant and/or deny rights to individual users or groups of users.
2. Restrict the ability to modify the system configuration.

**D. Additional System Integration Capabilities:** The DVRS shall be a non-proprietary system providing an open system architecture with the capability of being integrated with other systems (Analog or Digital) through a variety of methods.**E. Extendible GUI with Add-On Module Architecture:** The DVRS GUI shall support an add-on module architecture that enables the DVRS Manufacturer to add custom windows and menu options without modifying or recompiling the GUI application code. The DVRS Manufacturer shall provide a software development kit that enables developers to create custom applications and web pages with seamlessly integrated digital video features.**F. Advanced DVRS Functionality**

1. The DVRS shall provide a flexible platform framework to allow for expansion and enhancement as technology becomes available
2. Advanced Outdoor Motion Detection: The DVRS shall have the ability to leverage Intelligent Motion detection providing the ability to discriminate against motion that is not of interest based on the following parameters:
  - a. Show motion, so the user can see all movement that the motion detection algorithm sees.
  - b. Target size, minimum and maximum.
  - c. Compensate for distance from the camera.
  - d. Target speed, minimum and maximum.
  - e. Length of time target has been in field of view.

- f. Global change to compensate for events like a panning camera.
  - g. Target minimum movement.
  - h. Mask region.
  - i. Support arbitrarily shaped masks.
  - j. Contrast both global and local.
  - k. Target aspect ratio.
3. Web Based Video Retrieval: The DVRS shall support Web Based Video View or the Internet.

2.04 DVRS HARDWARE SYSTEM CONFIGURATION REQUIREMENTS:

- A. The DVRS shall be configured to provide the specific hardware specifications outlined:
- 1. DVRS Master Communication Server, which is a Windows Server based service used to control all of the data flow in the DVRS. The Master Communications Server shall be a redundant component offering two, hot-swappable power sources and two mirrored drives so that the SQL database maintaining the indexing schema for the DVRS' Video clips is protected.
  - 2. IP Based Digital Video Appliances
    - a. The DVRS shall utilize Digital Video Appliances (DVA) to compress and digitize the composite Analog video signals generated by the cameras. The DVA's shall be able to support multiple frame rates (CIF and 4 CIF) and multiple quality settings (Low, Medium, and High) for maximum user flexibility. The DVA's shall have the flexibility to support multiple digital streaming speeds from 1 Fps to 30 Fps and utilize a M-JPEG-4 compression algorithm.
    - b. IP Based Digital Video Recorders shall minimally have 32 inputs, 6 TB Hard Drive storage; DVR shall provide resolution capability of 1080P. DVR shall be compatible with motion JPEG.
  - 3. IP Based Digital Video Storage Recorders: The DVRS shall be configured to provide the specific software specifications outlined:
    - a. Recording rate and scheduling: The DVRS shall record all cameras at 10 FPS. The cameras can be defined as security cameras shall be initially configured for 24 hours per day. The other cameras are for process observation and no recording is required.



- b. Alarming functionality: The DVRS shall be fully capable of supporting robust alarm sources and offers robust alarm responses to those sources. These capabilities include the following abilities for alarm sources:
- (1) Alarm Inputs: Include DVR units or system components that accept alarm inputs from electrical devices. Inputs shall be configurable as normally open or normally closed.
  - (2) Video Activity Detection: DVR units capable of analyzing video images to detect activity. The absence of activity to correspond to the OFF state of the alarm source, and when activity is detected the state of the alarm source shall be ON.
    - (a) Provide a way to define the area(s) of interest for activity detection for a particular camera. The GUI to provide flexible drawing tools to enable the user to include and exclude multiple areas with rectangular or irregular shapes.
    - (b) Activity detection sensitivity to be configurable. When properly configured, the Network Digital Video Management System (NDVMS) to detect all legitimate activity while avoiding excessive false detection due to minor fluctuations in lighting or other insignificant changes in the video images.
  - (3) Video Loss Detection: DVR units to detect lost camera signals.
  - (4) Serial Alarm Interfaces: The NDVMS shall be able to receive messages from access control systems and other similar systems through serial communication interfaces. The NDVMS will interpret messages from the serial interface as state changes for one or more logical alarm contacts.
  - (5) Alarm Responses: Include a comprehensive feature set for responding to alarm messages.
    - (a) Alarm Responses: Include a comprehensive feature set for responding to alarm messages.
    - (b) Send instructions to multiple devices and system components in response to any alarm message, regardless of the source of the alarm message.
    - (c) Base alarm source configurations and alarm responses on a schedule. The alarm source configuration and alarm

responses to depend on the time of day and/or day of the week.

- (d) Alarm response to consist of various types of instructions to be executed by the NDVMS in response to each alarm message that can be generated by an alarm source.
  - (e) Recording Instructions: Start recording or change the recording mode for one or more cameras connected to one or more recorders.
  - (f) Call camera presets and call cameras to monitors for viewing live video associated with the alarm event.
  - (g) Relay Output Instructions: Control the state of one or more alarm relay outputs.
  - (h) Alarm Display Instructions: Specify how alarms shall be shown on alarm monitoring stations, including the colors to be used to indicate the alarm urgency, any messages to be displayed, whether video shall automatically display on the alarm monitoring station, etc.
  - (i) Termination Instructions: This type of instruction causes other instructions to stop.
- c. Failover Recording Mode: The DVRS shall require 100 available inputs for failover recording for the system. The failover requirement shall allow the system to have redundancy for up to 100 total cameras in the event of a system outage.
- d. Camera Presets: The DVRS shall provide comprehensive features to take advantage of camera presets in the System Software. The GUI software shall support the following features:
- (1) Setting Up Camera Presets: Provide GUI functions to enable authorized users to view and modify camera preset definitions when the PTZ cameras allow camera presets to be defined through a computer interface.
    - (a) Each preset to have a preset number and a description.
    - (b) Provide a button in the preset setup function to set the camera shot and a separate button to call the camera shot in order to verify that the preset is working properly.
    - (c) Allow user to designate one preset as the default preset, or to specify that autopan is the default. The NDVMS to

return the camera to the default preset or autopan mode when a user finishes controlling a camera or when a task ends that specified a different preset.

- (2) Access to Camera Presets when Viewing Live Video: Provide buttons and/or a dropdown list to select a camera preset when viewing live video (either on-screen or on an analog monitor controlled via the GUI). Interface to support selection of the autopan mode.
  - (3) Using Camera Presets for Scheduled Recording: Enable user to specify the camera preset to be used when defining scheduled recording tasks. The NDVMS to call the camera preset automatically when initiating the scheduled recording task.
  - (4) Using Camera Presets for Alarm Recording: Enable user to specify the camera preset to be used when defining recording instructions as part of an alarm response. The NDVMS to call the camera preset automatically when initiating the alarm recording task.
  - (5) Prioritizing Camera Presets: The NDVMS to use task priorities to determine which camera preset shall be called when multiple tasks are requesting different presets for the same camera. If a higher priority task overrides the preset for a lower priority task, the lower priority task's preset restored when the higher priority task ends.
  - (6) Using Camera Presets Associated with Camera Groups: The NDVMS to enable authorized users to define group presets for cameras. This is a camera preset that is called whenever the user drags and drops the group onto a monitor icon.
4. Camera Tours: The DVRS shall support robust camera tour functionality so that live viewing and monitoring of the site location is made easy for the surveillance staff. The DVRS software shall support the following set of features:
- a. Provide GUI functions to enable authorized users to view and modify camera tour definitions.
    - (1) NDVMS allows for creation of multiple camera tours.
    - (2) Each camera tour has multiple numbers of cameras.
    - (3) Each camera can have an associated preset and dwell time.

- (4) Dwell time can be set for all cameras in a camera tour in one operation.

## 2.05 CAMERAS

### A. High Resolution Color Camera:

1. Manufacturer: AXIS Communications 221 Network Camera, or equal.
2. General Requirements
  - a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
  - b. The manufacturer shall be ISO 14000 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.
  - c. This camera is designed to use a high quality IR-sensitive 1/3" progressive scan CCD sensor. Be equipped with a removable IR-cut filter, providing so-called day/night functionality. Be fitted with a high quality F1.4 Varifocal IR-corrected DC-iris lens and provide pictures down to 0.65 lux at F1.0 while in day mode (with IR-filter in use) and down to 0.08 lux while in night mode (with IR-filter removed).
  - d. The camera shall be able to deliver high-quality video in at least 15 different resolutions up to 640x480 pixels over IP networks.
  - e. The camera shall allow the transmission of images at up to 45 frames per second in all resolutions, using standard Motion JPEG format.
  - f. The camera shall incorporate Automatic and Manual White Balance and an electronic shutter operating in the range 2 and 1/12500 second.
  - g. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
  - h. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
  - i. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.
  - j. Customer-specific settings, including statically assigned IP address, the local time & date, event functionality and video configuration,

shall be stored in a nonvolatile memory and shall not be lost during power cuts or soft reset.

- k. Be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.

3. Electrical Specifications

- a. When powered via 24 VAC , the camera shall be synchronized to the power line zero crossing to ensure roll-free vertical interval video switching and recording. The vertical phase delay shall be adjustable from 0 to 358 degrees.
- b. Video output: The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket.
- c. Rated Voltage and Range
  - (1) Power over Ethernet according to IEEE 802.3af - Class 2
  - (2) 7-20 VDC, max 7 W

4. Mechanical Specifications

- a. Weight: 1.2 lb. (0.55 kg)
- b. Dimensions (less lens/including connectors)
  - (1) 1.5 H x 3.4W x 6.2 L inch (38 x 88 x 157mm)

5. Environmental Specifications

- a. Operating Temperature: 32 degrees F to + 122 degrees F. (0 degrees C to + 50 degrees C)
- b. Operating humidity: 20% to 80% non-condensing

6. Cameras Lens: Be equipped with a Varifocal 3.0 – 8.0mm F1.0, DC- iris, CS mount.

7. Housing: Axis T92A20 Housing

- a. Technopolymer(Polycarbonate), 3 removable cable glands
- b. Outdoor
- c. -4F to +122F (-20C to +50C)
- d. Power: 230VAC/ 44W

## B. Fixed Dome Network Camera

1. Manufacturer: AXIS Communications M3301 Fixed Dome Network Camera, or equal
2. General Requirements
  - a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
  - b. The manufacturer shall be ISO 14000 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.
  - c. Be designed to provide video streams at 30 frames per second in Motion JPEG, MPEG-4 or H.264, supporting resolutions up to 640x480 pixels.
  - d. Use a high quality 1/4" progressive scan sensor. Be fitted with a lens: Varifocal 2.8-10mm, F1.3, DC-iris.
  - e. The camera shall be able to deliver at least two individually configurable full resolution H.264 video streams over IP networks.
  - f. Support Motion JPEG encoding in a selectable range from 1 up to 30 frames per second in all resolutions. Support H.264 encoding in a selectable range from 1 up to 30 frames per second in all resolutions.
  - g. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
  - h. The camera shall incorporate Automatic and Manual White Balance and an electronic shutter operating in the range 1/4 and 1/5.000 second.
  - i. The camera shall provide backlight compensation with automatic and definable exposure zones.
  - j. Provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.
  - k. Be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.

## 3. Electrical Specifications

- a. When powered via 24 VAC , the camera shall be synchronized to the power line zero crossing to ensure roll-free vertical interval video switching and recording. The vertical phase delay shall be adjustable from 0 to 358 degrees.
- b. Video output: The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).
- c. Rated Voltage and Range: Power over Ethernet according to IEEE 802.3af – Class 1.

## 4. Mechanical Specifications

- a. Weight: 1.0 lb. (0.43 kg)
- b. Dimensions (less lens/including connectors): 3.7 H x 5.2 W x 5.2 L inch (94 x 132 x 132mm)
- c. Power Connections: Power over Ethernet according to IEEE 802.3af - Class 2 RJ-45 connector

## 5. Environmental Specifications

- a. Operating Temperature: 32 degrees F to + 122 degrees F. (0 degrees C to + 50 degrees C)
- b. Operating humidity: 20% to 80% non-condensing

## C. Exterior Dome Network Camera

- 1. Manufacturer: AXIS Communications P5522-E PTZ Network Dome Cameras, or equal
- 2. General Requirements
  - a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
  - b. The manufacturer shall be ISO 14000 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.

- c. Camera shall be designed to provide simultaneous Motion JPEG and MPEG-4 video, and support resolutions up to 720x480 pixels.
- d. Provide high speed pan and tilt functions, contain so called day/night functionality and be equipped with 18x optical and 12x digital zoom.
- e. The camera shall use a high quality IR-sensitive 1/4" CCD sensor and be equipped with a removable IR-cut filter, providing so-called day/night functionality.
- f. The camera shall be equipped with a high quality F1.4 – F3.0 DC-iris lens with 18x optical zoom providing a horizontal angle of view between 48° and 2.8°.
- g. Provide pictures down to 0.3 lux at F1.4 while in day mode (with IR-filter in use) and down to 0.005 lux while in night mode (with IR-filter removed).
- h. Be equipped with accurate high-speed pan-tilt functionality with 360° endless pan range.
- i. The camera shall be able to deliver high-quality video in at least 5 different resolutions up to 704x480 pixels (NTSC) or 704x576 pixels (PAL) over IP networks.
- j. The dome camera shall allow the transmission of images at up to 30 frames per second (NTSC) or 25 frames per second (PAL) in all resolutions, using Motion JPEG.
- k. The dome camera shall provide simultaneous support for both Motion JPEG and MPEG-4.
- l. Automatic and Manual White Balance, backlight compensation and electronic shutter operating in the range 1 and 1/10,000 second.
- m. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
- n. Provide a guard tour functionality which allow the dome to automatically move between selected presets using an individual speed and viewing time for each preset.
- o. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.



- p. Customer-specific settings, including statically assigned IP address, the local time & date, event functionality and video configuration, shall be stored in a nonvolatile memory and shall not be lost during power cuts or soft reset.
- q. Be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.

### 3. Electrical Specifications

- a. When powered via 24 VAC, the camera shall be synchronized to the power line zero crossing to ensure roll-free vertical interval video switching and recording. The vertical phase delay shall be adjustable from 0 to 358 degrees.
- b. Video Output: The dome camera shall be equipped with one 100baseTX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto sensing of network speed.
- c. Rated Voltage and Range
  - (1) 19-28 VAC, max 25 VA
  - (2) 24-40 VDC, max 20W

### 4. Mechanical Specifications

- a. Weight: 4 lb. (1.8 kg)
- b. Dimensions (less lens/including connectors): 8.9 H x 5.7 W x 5.7 L inch (225 x144 X 144mm)

### 5. Environmental Specifications

- a. Operating Temperature: 41 degrees F to + 122 degrees F. (5 degrees C to + 50 degrees C)
- b. Operating humidity: 20% to 80% non-condensing

### 6. Cameras Lens: F1.4-3.0, f=4.1mm wide to 73.8mm tele, autofocus; Focus range: 35mm (wide) or 800mm(tele) to infinity

### 7. Enclosure: Axis Pendant Dome

- a. Heavy Duty Rate Exterior with Heater

## D. Hybrid Camera

1. Manufacturer: Sony SNC-ZB550, or equal
2. General Requirements
  - a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
  - b. The manufacturer shall be ISO 14000 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.
  - c. This camera is designed to Use a high quality 1/3" progressive scan Exmor CMOS sensor.
  - d. The camera shall be able to deliver high-quality video in at least 15 different resolutions up to 1280 x 1024 pixels over IP networks.
  - e. The camera shall allow the transmission of images at up to 30 frames per second in all resolutions, using standard Motion JPEG format.
  - f. Be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.
3. Electrical Specifications
  - a. When powered via 24 VAC , the camera shall be synchronized to the power line zero crossing to ensure roll-free vertical interval video switching and recording. The vertical phase delay shall be adjustable from 0 to 358 degrees.
  - b. Video output: The camera shall be equipped with one NTSC standard/ PAL standard
4. Mechanical Specifications
  - a. Dimensions (with lens/not including projecting parts)

(1) 2 7/8 H x 2 1/2 W x 7 7/8 L inch (72 x 63 x 197mm)
5. Environmental Specifications
  - a. Operating Temperature: 41 degrees F to + 113 degrees F. (5 degrees C to + 45 degrees C)

- b. Operating humidity: 20% to 80% non-condensing
- 6. Cameras Lens: Be equipped with a high quality CS mount
- 7. Housing: Axis T92A20 Housing
  - a. Technopolymer(Polycarbonate), 3 removable cable glands
  - b. Outdoor
  - c. -4F to +122F (-20C to +50C)
  - d. Power: 230VAC/ 44W

## 2.06 HYBRID RECEIVER

A. Manufacturer: Sony SNCA-ZX104, or equal

B. General Requirements:

- 1. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
- 2. The manufacturer shall be ISO 14000 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.
- 3. Supports 4 hybrid cameras
- 4. Inputs: 4- BNC
- 5. Outputs: 4- BNC, 1 RJ45(100Base-TX/10Base-T)
- 6. Serial Interface: RS-485

C. Electrical Specifications

- 1. Requirements: DC12V (AC 100V to AC 127V, AC200V to AC 240V, 50/60Hz for AC adaptor)
- 2. Consumption: 8.5W/9.0W (AC100V/AC 240V) with AC adaptor

## 2.07 MIDSPAN POWER INJECTOR

A. Power of Ethernet (PoE) midspan power injector allow the follow of both power and data in one cable. Supporting standards IEEE 802.3af (Power over Ethernet), RFC 3621 (Power over Ethernet MIB)

## B. Connection

1. PoE ports and management port: Rj-45, shielded, EIA 586A and 586B
2. Electrical
  - a. Power Supply: 110 VAC, Input Current 4A@110V,
  - b. Output Voltage: 48VDC, Power 15.4 W minimal
3. Environmental
  - a. Operating Temperature: 0 to 40 degrees C (32 to 104 degrees F)
  - b. Operating Humidity: 10 to 90%, non-condensing
4. Management
  - a. SNMPv3 and Telnet
  - b. Multiple agents accessible through single management entity
  - c. Web-management via PowerView Pro application

## C. Security

1. MD5 authentication
2. DES privacy algorithm

- D. Manufacturer: PowerDesign PD-6512/AC/M 12-port and PD-6506/AC/M 6-port, Provided as needed with 20% spare capacity minimal.

## 2.08 ETHERNET MEDIA CONVERTERS/ FIBER OPTIC TRANSCEIVERS/ MULTIPLEXERS

- A. General: Contractor shall supply all components required for a fully operational system including mounting and housing hardware.

## B. Power supply Cabinet

1. The power supply cabinet shall be 19" 3HU rack mountable, while housing and powering twelve (12) single width rack mount modules. Power supply cabinets shall have all connections on the front side of the cabinet. Cabinets shall have reversible mounting brackets to allow for connections to be concentrated at the front or rear of the rack. Cabinets shall have two (2) built in fans for efficient cooling. Main voltage of the power supply cabinets shall be 100-120 Vac with a frequency of 50/60 Hz. Maximum drop out time shall be 10ms, and power efficiency at full load shall be greater than 90%. Maximum DC output power shall be 80 Watts.

2. The operating temperature of the cabinet shall be 0 degrees C to 40 degrees C, and have dimensions of LxWxH 9.4" (23.8cm) x19.0" (48.2cm) x 5.18"(13.2cm).
3. Contractor shall supply all mounting hardware where racks are not used.
4. The power supply cabinet shall be Allied Telesis model AT-MCR12-10 or approved equal.

C. Ethernet Media Converters

1. Media converter shall be able to convert media from both Ethernet and Fiber Optics to the other.
2. Media supported: Twisted Pair, Fiber (multi-mode)
3. Power Supply requirements: 100-240vAC 50/60Hz +/- 3%
4. Standard: IEEE 802.3U-LAN
5. Packet Transmission Characteristics:
  - a. Round Trip Delay: 0.4s Maximum
  - b. Bit Error Rate (BER): <10<sup>-12</sup>
6. The receiver shall be Allied Telesis model MC101XL-10 series or approved equal.

2.09 EQUIPMENT RACKS

- A. Provide equipment racks that meet the requirements of Section 16745 Telephone System.

2.10 UPS

- A. Provide UPS with a minimum of 4 hours continuous running time for all digital video equipment meeting the requirements of Section 16264 - Uninterruptible Power Supplies.

2.11 NETWORK SWITCH

- A. Provide network switches that meet the requirements of Section 16745 Telephone System.

## 2.12 MASTER COMMUNICATIONS SERVER

### A. General

1. The Communications Server controls all data flow.
2. The Communications Server tracks where each video clip resides, synchronizes all CPU time clocks, coordinates alarm responses, and manages recorder fail over functions.

### B. Dedicated Server and Workstations: Provide Dedicated Server and workstations having following minimum features:

### C. Dedicated Server

1. Processor: Dual Xeon, Dual Core CPU at 2.93GHz and 8MB cache, 1333 MHz FSB
2. Memory: 8GB of SDRAM
3. Monitor: 17-inch Rack mountable LCD
4. Hard Drive: 73GB 15K RPS SCSI hard drive
5. Network Card: Dual 10/ 100/ 1000 Ethernet Communication
6. 48X IDE CD-RW/DVD
7. Digital Tape Backup System
8. Pullout Keyboard and trackball
9. Graphics accelerator Card
10. Documentation: Provide all documentation, manuals and licenses.
11. Safety/Regulatory: UL, FCC B, approved
12. Latest revision of software at time of bid required:
  - a. Windows Server
  - b. Microsoft Office Professional
  - c. McAfee Virus Scan
13. Operator's Software: Provide necessary software to support video software program.

## D. Workstation

1. Processor: 3rd Generation Intel Core i7 – 3770 quad-core processor (3.4 GHz, 8MB Shared Cache).
2. Memory: 8GB of SDRAM
3. Monitor
  - a. LED LCD Type: 24-inch TFT active matrix
  - b. Video Input Signal: Analog RGB and digital DVI-D
  - c. Viewing Angle: 170 degrees horizontal, 160 degree vertical @ Contrast Ratio > 10:1
  - d. Contract Ratio: 1000:1
  - e. Brightness: 300cd/m2
  - f. Prime Mode: 1920 X 1080
  - g. Panel Surface Anti-glare, hard-coating
  - h. Mounting: VESA-compliant adapter plate)
4. Graphics Accelerator Card
5. Hard Drive: 1 TB minimum
6. DVDRW: 4X minimum
7. Mouse: Microsoft Trackball Explorer
8. Network Card: Gigabit 10/100/1000 PCI Network Interface
9. Keyboard: 104+ keys
10. Documentation: Provide all documentation, manuals and licenses
11. Safety/Regulatory: UL, FCC B, approved
12. Latest revision of software at time of bid required
  - a. Windows Professional
  - b. Microsoft Office Professional
  - c. McAfee Virus Scan
15. Video Software Package: Provide necessary software to support video software program.

## 2.13 INDUSTRIAL MONITORS

### A. Products

1. Allen Badley Model No. 6186-M15SSTR
2. Vartech Systems Inc. Model No. VT150PSS with resistive touchscreen
3. or approved equal

### B. Provide industrial monitors to allow viewing of specific camera locations. The industrial monitors that are UL Listed and shall have the following features:

1. Field monitors shall be a 15" stainless steel panel-mount LCD display, located in a NEMA 4X stainless steel enclosure.
  - a. LCD Type: 15-inch color TFT active matrix
  - b. Video Input Signal: Analog RGB and digital DVI-D
  - c. Contrast Ratio: 500:1
  - d. Brightness: 250 nits
  - e. Prime Mode: 1024 x 768
  - f. Anti reflective protective faceplate.
  - g. NTSC Ethernet, HD15/5BNC and coaxial cable input compatible.
  - h. Input Voltage: 120 V, 60Hz
  - i. Power Consumption: 24 W
  - j. Operational Temperature: 0°C to +50°C (32°F to +122°F)
  - k. Humidity: 10% to 90% relative, non-condensing.
  - l. Weight: (20 lbs)
  - m. Dimensions: 122 in H x 16.2 in W x 2.3 in D

## 2.14 RACEWAY SYSTEM

### A. A complete raceway system shall be provided for digital video systems in accordance with riser diagrams shown meeting the requirements of Section 16130 - Electrical Raceway Systems.

### B. Empty conduits shall be provided with pull wire to facilitate pulling of cables.

## 2.15 CABLING

### A. Wire and cable meet the requirements for digital video system cable in Section 16121 - Wire and Cable - 600 Volts and below.

### B. Fiber optic cables meeting the requirements for digital video system cable in Section 16723 - Fiber Optic Cable.



**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine areas and conditions under which digital video system's conduit systems and plywood mounting panels are to be installed. Correct conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Resident Engineer.

**3.02 INSTALLATION**

- A. General: Install digital video system as shown or required. Comply with requirements of the Electrical Code for the City of New York, NEC and local electrical codes.
- B. Pole Mounted Cameras: Coordinated mounting details for camera installed on lighting with lighting poles manufacture as specified in Section 16511 – Lighting.
- C. Install conduit systems wiring, and plywood mounting panels as indicated and in accordance with the drawings and with recognized industry practices.
- D. Install system per the manufacturer's guidelines.
- E. Verify the operational compatibility and configuration requirements of all devices.
- F. Provide independent support from building structure for all devices.
- G. Submit typical mounting arrangement for all devices.

**3.03 TESTING AND COMMISSIONING**

- A. The supplier shall be responsible for final system hardware hook-up and checkout prior to commissioning the system to the DSNY.

**3.04 PROGRAMMING SERVICES**

- A. Additional programming services shall be provided by the system manufacturer's representatives in the following areas:
  - 1. Database/importation
  - 2. Customized system programming
  - 3. Operational programming
  - 4. Custom report design/development generation
  - 5. Custom video badge design
  - 6. Graphical map design/development and test
  - 7. Camera naming
  - 8. CCTV camera call-up and recording features

9. Alarm responses
10. System database backup

### 3.05 SOFTWARE SUPPORT

- A. The manufacture shall supply all software upgrades and support for two (2) years after acceptance.

### 3.06 FIELD SERVICES

- A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the digital video system manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01821 – Training. Provide all instruments and equipment necessary to conduct required tests, adjustments and training. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.
- B. All equipment shall be tested for proper operation. Testing shall be observed by DSNY for general compliance with the intended use.
- C. Training: Following completion of installation and field testing provide training for 12 employees of the DSNY in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the DSNY's facilities at a time agreeable to the DSNY:
  1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

### 3.07 CLEANING AND REPAIR

- A. Contractor shall clean out and discard all materials used in the construction of the system.
- B. All damage caused during installation shall be repaired to the original state by the Contractor.
- C. All repairs shall meet the Resident Engineer's satisfaction to be acceptable.

### 3.08 SCHEDULE OF CAMERA EQUIPMENT

A. Abbreviations used in the schedule are as follows:

Service

S – Security

PO- Process Observation

Camera Types

HRCC - High Resolution Color Camera

FDNC – Fixed Dome Network Camera

EDNC – Exterior Dome Network Camera

HC - Hybrid Camera

Camera Schedule 91ST Street Marine Transfer Station				
CAMERA NUMBER	LOCATION	SERVICE	CAMERA TYPE	PTZ
C1	BUILDING EXTERIOR	S	EDNC	Y
C2	LIDDING AREA (OUTDOORS)	PO	HRCC	N
C3	LIDDING AREA (OUTDOORS)	PO	HRCC	N
C4	BUILDING EXTERIOR	S	EDNC	Y
C5	GALLERY	S	FDNC	N
C6	LIDDING ROOM	S	FDNC	N
C7	GALLERY	S	FDNC	N
C8	GALLERY	S	FDNC	N
C9	CORRIDOR	S	FDNC	N
C10	COORIDOR	S	FDNC	N
C11	CORRIDOR	S	FDNC	N
C12	BUILDING EXTERIOR	S	EDNC	Y
C13	BUILDING EXTERIOR	S	EDNC	Y
C14	UPPER LIDDING AREA (LOADING)	PO	HRCC	N
C15	UPPER LIDDING AREA (LOADING)	PO	HRCC	N
C16	UPPER LIDDING AREA (LOADING)	PO	HRCC	N
C17	UPPER LIDDING AREA (LOADING)	PO	HRCC	N
C18	BUILDING ENTRANCE (LOADING)	S	HRCC	N
C19	ENTRANCE (TIPPING)	S	HRCC	N
C20	BUILDING ENTRANCE (TIPPING)	S	HRCC	N
C21	INBOUND SCALE	S	HRCC	N
C22	TIPPING AREA	PO	HRCC	N
C23	TIPPING AREA	PO	HRCC	N
C24	LOADING AREA (MEZZ)	PO	HC	N
C25	LOADING AREA (MEZZ)	PO	HC	N
C26	PARKING LOT	S	EDNC	Y
C27	OUTBOUND SCALE	S	HRCC	N
C28	BARGE (OUTDOOR)	S	EDNC	Y
C29	BARGE (OUTDOOR)	S	EDNC	Y
C30	TRUCK ENTRANCE	S	HRCC	N
C31	LIDDING ROOM	S	FDNC	N
C32	TRUCK EXIT	S	HRCC	N
C33	OUTBOUND LANE	S	HRCC	N
C34	INBOUND LANE	S	HRCC	N

-END OF SECTION-

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# ADDENDA CONTROL SHEET

**TITLE: Southwest Brooklyn Marine Transfer Station – Building Construction**

[illegible]



THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

November 2, 2012

**ADDENDUM No. # 4**

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

**S216-399A**

**Southwest Brooklyn Marine Transfer Station – Building Construction**

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for November 15, 2012, at 2:00 pm is rescheduled to November 20, 2012, at 2:00 pm.**

Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**

See Attachment A.

3. **Revisions to Addendum #2:**

See Attachment B.

4. **Revisions to Specifications:**

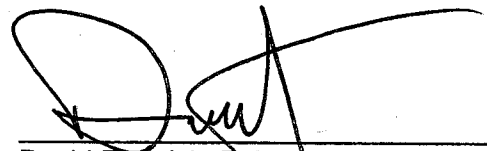
See Attachment C.

5. **Revisions to Drawings:**

See Attachment D.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.

  
\_\_\_\_\_  
David Resnick, R.A.  
Deputy Commissioner

\_\_\_\_\_  
Name of Bidder

By: \_\_\_\_\_





**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT A – BIDDERS QUESTIONS AND DDC RESPONSES**

No.	Bidders' Questions	DDC Responses
1	Regarding specification section 16742-1.07, please provide the radio frequencies that are currently being used at another City of New York transfer station.	Radio frequencies have not been finalized at the transfer stations that are currently under construction.
2	Spec 15810-5 2.02-C calls for all spiral ductwork to be 6" W.G. Spec 15810-5 2.01-H1 "Refer to equipment schedules for duct system pressures and seal classifications." The majority of the ductwork required by the equipment schedule on this project will be 2" W.G. Please confirm all spiral duct is to be 6" W.G.  What pressure class should the rectangular duct be built to?	Provide ductwork classified as follows: <ul style="list-style-type: none"> <li>• For fan systems with 0.0-1.5" ESP: Provide 2" pressure class ductwork.</li> <li>• For fan systems with 1.5-3.5" ESP: Provide 4" pressure class ductwork.</li> <li>• For fan systems with 3.5" or greater ESP: Provide 6" pressure class ductwork.</li> </ul>
3	Spec 15810-7 3.01-B states "Provide duct lining at the following locations: Ductwork and plenums conveying outside air, extending from intake louvers through to the inlet side of all air-handling units." Please confirm duct lining is required at these locations.  Also, please specify a type.	Provide duct lining as required in Specification 15810 Section 3.01.B. Do not provide duct insulation where duct is lined, per Specification 15815, Section 3.02.A.  Provide duct liner per Specification 15815, Section 2.02.D:  D. Internal Duct Liner Insulation - Acoustical Insulation: <ol style="list-style-type: none"> <li>1. Type: Fiberglass duct liner board with black surface</li> <li>2. Density: Minimum 1-1/2 lbs. per cubic foot</li> <li>3. Thickness: 1-1/2 inch minimum</li> <li>4. Thermal Conductivity: 0.23 Btu-Inch/HR.FT2. °F @ 75F mean temperature</li> </ol>
4	Re: Appendix I To what elevation does the existing fendering system extend to?	The top of the existing fendering system extends to +4.5' above the Brooklyn Highway Datum, as shown on drawing S-902.00.
5	Re: Concrete Restoration 03930 Please advise as to the possible locations concrete restoration will be required.	As indicated in Section 03930, Part 1.01.B:  "B. The concrete restoration work specified herein is applicable to existing structural concrete elements that are to remain and become incorporated in the final structures. The actual



No.	Bidders' Questions	DDC Responses
		<p>extent of the work shall be determined on the basis of field inspections conducted jointly by the Contractor and the Commissioner."</p> <p>Although the exact locations and extent of work will be determined on the basis of these field inspections, potential locations of concrete restoration include existing concrete surfaces to remain after demolition operations are complete.</p>
6	<p>On Contract Drawing S-100, Notes 1 through 3 describe the procedure for demolition and survey of the existing piles. Please confirm the expected time duration (work or calendar days) between submittal of an existing pile survey and a response with direction regarding revised pile locations and construction methods.</p>	<p>The Contractor's survey of existing foundation piles, performed following the demolition of the existing base slab, will be processed and reviewed similar to other Contractor submittals.</p>
7	<p>Please refer to Specification 01330, "Shop Drawings," Page 01330-5, Paragraph 1.06H. The Commissioner states that "a reasonable time should be allowed for" submittals to be reviewed and returned. Please confirm, in work or calendar days, expected turnaround times for submittals.</p>	<p>Although every effort will be made to return submittals within 10 working days, there is no firm commitment or guarantee for submittal turnaround time. Actual turnaround time will depend on many variables, including the size, complexity, completeness and proper sequencing of the submittals.</p>
8	<p>In Addendum #3, Attachment E – Revisions to the Drawings, a note is made to "Refer to Drawing C-003.01 and make changes. We do not believe we have received Drawing C-003.01 in any of the addendum. Please confirm when this drawing was made available.</p>	<p>There is no Drawing C-003.01 in Addendums #1 through #3. Drawing C-003.00 was not re-issued. Addendum #3 should have referred to Drawing C-003.00.</p> <p>Note, however, that Drawing C-003.00 was revised in Addendum 2, but not re-issued.</p>
9	<p>With regards to the concrete formwork of the ramp top slab (formwork within the diaphragms), please advise if we can use stay-in-place void forms off of the bridge concrete.</p>	<p>All formwork is to be removed as per drawings R-001 &amp; R-201 General Note 15.</p>
10	<ol style="list-style-type: none"> <li>On Drawing C-035.00 under Note 1 it states that the treatment capacity for STS 1 is 6.0cfs-8.5cfs and STS 2 is 14cfs-17.5cfs. What is the actual required treatment flow rate for each of the locations? Is the capacity given in the notes the peak flow rates or actual design flows?</li> <li>If the exact treatment flow capacity at each location is not known, at what flow rate do I provide an equal for? The range of capacity at each location is not specific enough for us to provide an equal. There</li> </ol>	<p>Three units are to be provided. Please see drawing C-029.01, C-028.1, C-026.02, and C-035.01 for locations and details.</p> <ol style="list-style-type: none"> <li>The range provides the average flow and the peak flow (average cfs - peak cfs). The units should be sized to adequately capture and treat the peak flows as follows: STU-1 peak flow of 8.5 cfs, STU-2 peak flow of 17.5 cfs, and STU-3 peak flow of 8.5 cfs.</li> <li>See response above. Provide units that meet the peak flow requirements for each stormwater treatment unit as indicated in the</li> </ol>



No.	Bidders' Questions	DDC Responses
	is roughly an \$8,000 cost difference from a unit that can treat 14 cfs and a unit rated for 17.5 cfs.	response above.



**DDC PROJECT #:** S216-399A

**PROJECT NAME:** SOUTHWEST BROOKLYN MARINE TRANSFER STATION

**ATTACHMENT B – REVISIONS TO ADDENDUM NO. 2**

**REFER TO DRAWING H-401.00**

Delete the following draft inducer fan to the “CHIMNEY AUTOMATION SYSTEM” schedule.

UNIT I.D : F-DIF-03  
SYSTEM (S): WATER HEATER  
TYPE: MODULATING DRAFT INDUCER  
FAN: RSIF 146  
HP/RPM: 1/10 HP / 1600 RPM  
ELEC CHAR.:  
- V/PH/Hz 120/1/60  
- AMP 1.2  
MODULATING PRESSURE CONTROLLER:  
- EBC10 INTERLOCK CONTROLLER  
- PDS DRAFT PRVING SWITCH  
- FSC FAN SPEED CONTROLLER  
ELEC CHAR.:  
▪ V/PH/Hz 120/1/60  
▪ AMP 6.3  
MANUFACTURER: ENERVEX  
REMARKS/NOTES: MECHANICAL DRAFT SYSTEM





**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT C – REVISIONS TO THE SPECIFICATIONS**

Specification Section 14640 Container Gantry Crane

1. Page 14640-10, Part 2.02A.16: After this part, add the following:

“A warning plate stating “CAUTION CONTAINER STACKS MAXIMUM 2 HIGH ON PIER OR BARGE” shall be installed in the operator’s cab within the operator’s normal line-of sight.”

2. Page 14640-40, Part 2.07B.10.d: Revise the second sentence to read as follows:

“The bus bar shall be provided with a PVC cover and electric heat tracing to prevent ice accumulation.”

Specification Section 15551 Chimney Automation System, Page 15551-4

Part 2.02E.1. Revise to read as follows:

- “1. Upon a call for heat all the appliance(s) connected to the chimney automation system, including the water heater will satisfy all internal safeties, and before the gas valve is opened the call for heat will land at the controller so the draft fan can start. Once the proof of flow for the draft fan has occurred and the adjustable pre purge time delay has elapsed the controller will send the start command back to the appliance so the gas valve can open and the appliance can start. All appliances are to be interlocked with either (lead or lag) controller.



**DDC PROJECT #: S216-399A**

**PROJECT NAME: SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

**ATTACHMENT D – REVISIONS TO THE DRAWINGS**

**REFER TO DRAWING C-031.00**

Detail "TYPICAL M.S.E.S. SECTION", in center section between the 8' Thick Wall and the Front Face of Panel, revise "COMPACTED EMBANKMENT BACKFILL PER PROJECT SPECIFICATION" to read "SELECT FILL PER PROJECT SPECIFICATION".

**REFER TO DRAWING C-047.00**

Refer to TYPICAL SECONDARY POWER DUCT BANK:

1. Change dimension '1'-8"(TYP)' to read '1'-10".
2. Change dimension '6'-10"(TYP)' to read '3'-8 1/2"
4. Revise duct bank to show 5 columns of 2 ducts each.

**REFER TO DRAWING S-385.00**

1. In Detail 1/S-210, 212:
  - a. Replace the elevation call-out label at the vehicular scale load cell support beams that currently reads "T/ENCASEMENT EL 38.20" with "T/ENCASEMENT EL 38.04".
  - b. Replace the six (6) framing member labels at the vehicular scale load cell support beams that currently read "W10X49 (37.96)" with "W10X49 (37.79)".
2. In Section 2/S-385, replace the vertical dimension between the vehicular scale load cell support beam and the top of the scale weighbridge deck that currently reads "1'-3 1/2 \*\*\*" with "1'-5 1/2 \*\*\*".
3. In Section 3/S-385, replace the vertical dimension between the vehicular scale load cell support beam and the top of the scale weighbridge deck that currently reads "1'-3 1/2 \*\*\*" with "1'-5 1/2 \*\*\*".

**REFER TO DRAWING R-002.00**

Replace Drawing R-002.00 with Drawing R-002.01, a copy of which is attached hereto.

**REFER TO DRAWING R-004.00**

Replace Drawing R-004.00 with Drawing R-004.01, a copy of which is attached hereto.

**REFER TO DRAWING R-005.00**

Replace Drawing R-005.00 with Drawing R-005.01, a copy of which is attached hereto.

**REFER TO DRAWING R-015.00**

Replace Drawing R-015.00 with Drawing R-015.01, a copy of which is attached hereto.

**REFER TO DRAWING R-016.00**

Replace Drawing R-016.00 with Drawing R-016.01, a copy of which is attached hereto.

**REFER TO DRAWING R-053.00**

Replace Drawing R-053.00 with Drawing R-053.01, a copy of which is attached hereto.



**REFER TO DRAWING R-054.00**

Replace Drawing R-054.00 with Drawing R-054.01, a copy of which is attached hereto.

**REFER TO DRAWING R-063.00**

Replace Drawing R-063.00 with Drawing R-063.01, a copy of which is attached hereto.

**REFER TO DRAWING R-064.00**

Replace Drawing R-064.00 with Drawing R-064.01, a copy of which is attached hereto.

**REFER TO DRAWING R-083.00**

Replace Drawing R-083.00 with Drawing R-083.01, a copy of which is attached hereto.

**REFER TO DRAWING R-205.00**

Replace Drawing R-205.00 with Drawing R-205.01, a copy of which is attached hereto.

**REFER TO DRAWING R-215.00**

Replace Drawing R-215.00 with Drawing R-215.01, a copy of which is attached hereto.

**REFER TO DRAWING R-216.00**

Replace Drawing R-216.00 with Drawing R-216.01, a copy of which is attached hereto.

**REFER TO DRAWING R-253.00**

Replace Drawing R-253.00 with Drawing R-253.01, a copy of which is attached hereto.

**REFER TO DRAWING R-254.00**

Replace Drawing R-254.00 with Drawing R-254.01, a copy of which is attached hereto.

**REFER TO DRAWING R-264.00**

Replace Drawing R-264.00 with Drawing R-264.01, a copy of which is attached hereto.

**REFER TO DRAWING R-283.00**

Replace Drawing R-283.00 with Drawing R-283.01, a copy of which is attached hereto.

**REFER TO DRAWING T-014.00**

1. Change dimension from pier level to MHHW. Revise "11.37" to read "10.74".
2. Change dimension from pier level to MLLW. Revise "16.547" to read "16.05".

**REFER TO DRAWING T-015.00**

1. Change dimension from pier level to MHHW. Revise "11.37" to read "10.74".
2. Change dimension from pier level to MLLW. Revise "16.547" to read "16.05".

**REFER TO DRAWING H-003.00**

Replace Drawing H-003.00 with Drawing H-003.01, a copy of which is attached hereto.

**REFER TO DRAWING H-101.01**

Replace Drawing H-101.01 with Drawing H-101.02, a copy of which is attached hereto.

**REFER TO DRAWING H-104.01**

Delete 8" flue and any associated labels along Col Line B, between Col line 1 to 12.



**REFER TO DRAWING H-106.01**

Delete 8" flue and any associated labels north of Stair A by Col Line B-1.

**REFER TO DRAWING H-108.01**

Delete 8" flue and any associated labels north of Stair A by Col Line B-1.

**REFER TO DRAWING H-203.01**

Delete 8" flue and any associated labels north of Stair A between Col Line B and C.





THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF STRUCTURES

**ADDENDUM TO THE GENERAL CONDITIONS**

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**The General Conditions are hereby amended in accordance  
with the terms and conditions set forth in this Addendum.**

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**I. PROJECT DESCRIPTION**

**FMS #: SA216-399A**

**PROJECT NAME: Southwest Brooklyn Marine Transfer Station**

**PROJECT DESCRIPTION:** This Project consists of the construction of a new marine transfer station. The principal items of work include construction of a new marine transfer station with access ramps, demolition of existing fendering systems, site work, utilities, equipment, dredging, HVAC systems, plumbing systems, fire protection, and electrical systems.

**PROJECT LOCATION: 1824 Shore Parkway**  
**BOROUGH: Brooklyn**  
**CITY OF NEW YORK**  
**ZIP CODE: 11214**  
**COMMUNITY BOARD #: 11**

**PROJECT MANAGEMENT:**

- ☐ DDC shall publicly bid and enter into a single Contract for the Project. DDC shall manage the Project using its own personnel.
- ☒ DDC shall publicly bid and enter into a single Contract for the Project. A Construction Management firm (the "CM") hired by DDC shall manage the Project. The Contractor is advised that the CM shall serve as the representative of the Commissioner at the site and shall, subject to review by the Commissioner, be responsible for the inspection, management, coordination and administration of the required construction work, as delineated in the article of the Standard Construction Contract (September 2008) entitled "The Resident Engineer".
- ☐ DDC has entered into CM/Build Contract for the Project. The CM/Build Contractor shall be responsible for conducting a competitive bid process and entering into the contract(s) for the Project.

**II. CM / BUILD CONTRACT: REVISIONS TO THE GENERAL CONDITIONS**

Not Used

### III. CONTRACTS FOR THE PROJECT

The Project consists of a single contract, the Contract for General Construction Work. The Contractor for General Construction Work is responsible for the performance of all required work for the Project as set forth in the Contract Documents (General Conditions, Drawings and Specifications), including all responsibilities and obligations assigned to separate Contractors for the following subdivisions of the work: Plumbing Work, HVAC Work, and Electrical Work. All responsibilities and obligations in the Contract Documents assigned to separate Contractors for such subdivisions of the work are the responsibility of the Contractor for General Construction Work.

### IV. SCHEDULES

The Contractor is advised that Schedules A through F are attached to, and incorporated as part of, this Addendum to the General Conditions. These schedules contain important information that is specific to this Project. The Contractor is advised to carefully review these schedules.

### V. APPLICABILITY OF ARTICLES AND AMENDED ARTICLES

The Contractor is advised that various Articles in the General Conditions may not apply to this Project or may apply as amended. Such Articles advise the Contractor to "Refer to the Addendum to the General Conditions for the applicability of this Article." Such Articles are set forth below. A check mark indicates whether the Article (1) applies to the Project, (2) does not apply to the Project, or (3) applies to the Project as amended. If no box is checked, the Article, as set forth in the General Conditions, applies to the Project. Amended Articles, if any, are set forth following this list of Articles.

<u>Article No.</u>	<u>Article</u>	<u>Sub-Article or PART</u> (if applicable)	<u>Applies</u>	<u>Does not Apply</u>	<u>Applies as Amended</u>
1.02	Scope and Intent	B )	PROGRESS SCHEDULE		X
1.04	Contract Drawings	C )	PRINTS	X	
1.05	Shop Drawings and Record Drawings	A )	SHOP DRAWINGS		X
		B )	INTEGRATED DRAWINGS	X	
1.09	Surveys				X
1.13	Sleeves and Hangers				X
1.15	Temporary Heat				X
1.20	Progress Photographs		X		
1.26	Security Guards/Fire Guards on the Site				X
1.29	Sleeve and Penetration Drawings		X		
1.30	Location of Partitions		X		
1.34	Temporary Services		PART A	X	
			PART B		X
1.35	Temporary Use, Operation and Maintenance of Elevators during Construction		PART A – For New Buildings Up to 15 Stories	X	
			PART B – For New Buildings Over 15 Stories	X	
			PART C – Existing Buildings	X	

<u>Article No.</u>	<u>Article</u>	<u>Sub-Article or PART</u> (if applicable)	<u>Applies</u>	<u>Does not Apply</u>	<u>Applies as Amended</u>
1.36	General Mechanical Requirements		X		
1.37	General Electrical Requirements	PART B – Section A) Temporary Lighting			X
		PART B – Section B) Site Security Lighting (New Construction)			X
		PART D – Electrical Conduit System Including Boxes			X
		PART E – Electrical Wiring Devices			X
		PART F – Electrical Conductors and Terminators			X
		PART G – Circuit Protective Devices			X
		PART H – Distribution Centers			X
		PART I – Motors			X
		PART J – Motor Control Equipment			X
1.40	Separation Between Trades				
1.42	Specific Requirements	C ) BORINGS			X
		E ) WORK FENCE ENCLOSURE			X
		G ) RESIDENT ENGINEER'S OFFICE			
		1. OFFICE SPACE IN EXISTING BUILDING		X	
		2. TRAILER OFFICE			X
		H ) ADDITIONAL EQUIPMENT FOR THE RESIDENT ENGINEER			X
		I ) PUBLIC TELEPHONE		X	
		Q ) PROJECT SIGN AND RENDERING			
		PART B – PROJECT RENDERING		X	

#### COMPUTER WORKSTATIONS

H) Number of Computer Workstations to be provided as outlined in Article 1.42 H, item 4: 10

## AMENDED ARTICLES

The Contractor is advised that the amended Articles set forth below are included in the General Conditions and apply to the Project.

- Article 1.02 B) **Progress Schedule** is replaced with Section 01321 Construction Progress Scheduling
- Article 1.05 A) **Shop Drawings** is amended to include Section 01330
- Article 1.09 **Surveys** is replaced with Section 01435 Monitoring Survey
- Article 1.13 **Sleeves and Hangers** is replaced with Section 15060 Hangers and Supports
- Article 1.15 **Temporary Heat** is replaced with Section 01512 Temporary Heating and Ventilating Facilities
- Article 1.26 **Security Guards/Fire Guards on the Site** is replaced with Section 01561 Site Security
- Article 1.34.PART B.B **Temporary Services - Electrical** is replaced with Section 16020 Temporary Electrical System
- Article 1.37 **General Electrical Requirements** is replaced with Sections 01513 Temporary Power Facilities, 16050 Basic Electrical Materials and Methods, 16121 Wires and Cables – 600 Volts and Below, 16122 Medium Voltage Cables, 16130 Electric Raceway System, 16140 Wiring Devices, 16220 Electric Motors, Section 16411 Disconnect Switches, 16430 480 Volt Switchgear, 16443 Panelboards and 16445 Motor Control Centers
- Article 1.42.G **Specific Requirements – Resident Engineer's Office** and Article 1.42 H **Additional Equipment for the Resident Engineer** is replaced with Section 13125 Resident Engineer's Field Office Trailer

## VI. ADDITIONAL ARTICLES

The Contractor is advised that the additional Articles set forth below are included in the General Conditions and apply to the Project.

### 1.43 DDC Safety Requirements

The Department of Design and Construction Safety Requirements included with the Information for Bidders are revised to include the following:

- A) The Contractor shall employ a properly qualified safety professional familiar with all work under the Contract whose duties shall be to initiate, review, and cause implementation of measures for the protection of health and the prevention of accidents. The Contractor shall also employ a full-time onsite safety representative(s) whose duties shall be to work under the direct supervision of the safety professional to implement the safety program for the work of that Contractor. Subcontractors shall employ a properly qualified safety professional for work that is of a nature that is not within the area of safety expertise of the prime Contractor's safety professional and onsite safety representative. The safety representatives shall not be the Contractor's or any of the subcontractor's project manager, engineer, superintendent, or anyone else working on the project.
- B) **Safety Professional Qualifications:** Recognition as a safety professional shall be based on a minimum of: certification by the Board of Certified Safety Professionals as a Certified Safety Professional; certification by the New York State Department of Labor pursuant to 12 NYCRR Section 59 1.12; certification by the American Board of Industrial Hygiene as a Certified Industrial Hygienist; certification by the World Safety Organization as a Certified Safety Manager or Certified Safety Specialist; and 3 years of professional safety management experience in the types of construction and conditions expected to be encountered on the site.
- C) **Safety Representative Qualifications:** Qualifications of the safety representative(s) shall include a minimum of: 3 years of relevant construction experience (2 years of which were exclusively in construction safety management), successful completion of a 30-hour Occupational Safety and Health Administration (OSHA) Construction Safety and Health training course, 40-hour OSHA Hazardous Materials training course (if involved in demolition and waste handling), excavation competent person training, and Confined Space training.

## VII. SPECIAL EXPERIENCE REQUIREMENTS FOR THE PROJECT

- (1) **GENERAL:** The following are set forth below: (a) Special Experience Requirements applicable to the contractor or subcontractor that will perform specific areas of work, and (b) Special Experience Requirements applicable to the manufacturer that will provide specific material or equipment.
- (2) **REVISION OF SPECIFICATIONS AND DRAWINGS:** In the event the Specifications and/or the Contract Drawings contain any Special Experience Requirement that is not set forth below, such Special Experience Requirement is deemed deleted, except as otherwise expressly provided in Section VIII of this Addendum.
- (3) **SPECIAL EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK:** The special experience requirements set forth below apply to the contractor or subcontractor that will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor that will perform these specific areas of work. If the contractor intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the contractor intends to subcontract these specific areas of work, the proposed subcontractor(s) must demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.
  - (a) **Special Experience Requirement #1:** The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition, the contractor or subcontractor must be certified, licensed or approved by the manufacturer. This Special Experience Requirement applies to the contractor or subcontractor that will perform specific areas of work specified in the sections set forth below.

General Construction:

- Section 07610: Sheet Metal Roofing

- (4) **SPECIAL EXPERIENCE REQUIREMENTS FOR MANUFACTURERS:** The special experience requirements set forth below apply to the manufacturer that will supply or fabricate specific material or equipment. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of award, the contractor will be required to submit the qualifications of the proposed manufacturer(s). Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.
  - (a) **Special Experience Requirement #2:** The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years. This Special Experience Requirement applies to the manufacturer that will provide material or equipment specified in the section(s) set forth below.

General Construction:

- Section 07610: Sheet Metal Roofing

## VIII. REVISIONS: SPECIFICATIONS AND CONTRACT DRAWINGS

The Specifications and the Contract Drawings for the Project are revised in accordance with the provisions set forth below.

- (1) Owner: Wherever the term "Owner" is used in the Specifications and/or the Contract Drawings, such term shall mean the City of New York.
- (2) Other Entities: In the event any entity other than the City of New York is referred to or named as the "Owner" in the Specifications and/or the Contract Drawings, the name of such other entity is deemed deleted and replaced with the "City of New York".
- (3) Architect / Engineer: Wherever the words "Architect", "Engineer", "Architect / Engineer" or "Architect and/or Engineer" are used in the Specifications and/or the Contract Drawings, such words are deemed deleted and replaced with the word "Commissioner".
- (4) Products / Manufacturers: Wherever the Specifications and/or the Contract Drawings require the contractor to provide a particular product (i.e., material and/or equipment) from a designated manufacturer and/or vendor, the term "or approved equal" is deemed inserted, even if only one product and/or manufacturer is specified, except as otherwise provided below.
  - (a) Proprietary Items: If the Bid Booklet contains a Notice which identifies a particular product from a designated manufacturer as a "Proprietary Item", the Contractor shall be required to provide such specified product. In such case, no substitution or "approved equal" will be permitted.
- (5) Special Experience Requirements: Special Experience Requirements for the Project, if any, are set forth in the Bid Booklet. Special Experience Requirements may apply to contractors, subcontractors, installers, manufacturers and/or suppliers. If the Specifications and/or the Contract Drawings contain any Special Experience Requirement that is not set forth in the Bid Booklet, such Special Experience Requirement is deemed deleted, except as otherwise provided below.
  - (a) Any Special Experience Requirement that provides that the entity performing the work or supplying the material must have more than three (3) years of experience, is revised to provide that the entity performing the work or supplying the material must have three (3) years of experience, except as described in paragraph (b) below.
  - (b) Any Special Experience Requirement that pertains to the abatement of hazardous materials shall not be subject to the deletion and/or revision set forth above. Such Special Experience Requirement shall remain in full force and effect.
  - (c) Any Special Experience Requirement that provides that the entity performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such entity must be properly trained for the specified work.
  - (d) Any Special Experience Requirement that provides that the individual workers performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such individual workers must be properly trained for the specified work.
- (6) Alternate Bids: If the agency is requesting the submission of Alternate Bids, a Notice regarding such Alternate Bids is set forth in the Bid Booklet. In the event of any conflict or inconsistency between (1) the Notice regarding Alternate Bids set forth in the Bid Booklet and (2) a provision in the Specifications and/or the Contract Drawings regarding Alternate Bids, the Notice set forth in the Bid Booklet shall prevail. If the agency is not requesting the submission of Alternate Bids, as indicated by the absence of a Notice in the Bid Booklet, and the Specifications and/or the Contract Drawings contain any provision regarding Alternate Bids, such provision is deemed deleted.
- (7) Contractor Retained Engineer: If the Specifications and/or the Contract Drawings require the Contractor to retain an Engineer to provide engineering services for the Project, the following sentence is deemed inserted: "Such Engineer must be a Professional Engineer, licensed in the State of New York."

- (8) LEED Related Provisions: If the Specifications and/or the Contract Drawings require the Contractor to purchase FSC certified wood, rapidly renewable materials, or materials within 500 miles, such provisions are deemed deleted and replaced with the requirement that if the contractor has purchased FSC certified wood, rapidly renewable materials, or materials within 500 miles, the contractor shall submit such forms or documentation as may be required by the City in order for the USGBC to certify that the Project qualifies for the related LEED credit(s).
- (9) Guarantees: Requirements for Guarantees and Maintenance are set forth in Schedule B, which is included in the Addendum to the General Conditions. In the event of any conflict or inconsistency between (1) a guarantee and/or maintenance requirement set forth in the Specifications and/or the Contract Drawings and (2) a guarantee and/or maintenance requirement set forth in Schedule B, the guarantee and/or maintenance requirement set forth in Schedule B shall prevail.
- (10) Warranties: Requirements for Warranties are set forth in Schedule B, which is included in the Addendum to the General Conditions.
- (a) In the event of any conflict or inconsistency between (1) a warranty requirement set forth in the Specifications and/or the Contract Drawings and (2) a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall prevail.
- (b) In the event a warranty requirement set forth in the Specifications and/or the Contract Drawings is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications and/or the Contract Drawings, shall remain in full force and effect.
- (c) In the event a warranty requirement for a particular item of material or equipment is omitted from Schedule B, as well as from the Specifications or the Contract Drawings, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.
- (11) Exculpatory Provisions: In the event the Specifications and/or the Contract Drawings contain any provision whereby the consultant and/or any of its officers, employees or agents, including subconsultants, is absolved of responsibility for any act or omission, such provision is deemed deleted.
- (12) Insurance: Provisions regarding insurance coverage the Contractor is required to provide are set forth in Article 22 of the City of New York Standard Construction Contract and Schedule A, which is included in the Addendum to the General Conditions. In the event the Specifications and/or the Contract Drawings contain any provision regarding insurance requirements, such provision is deemed deleted.
- (13) Indemnification: Provisions regarding indemnification are set forth in Articles 7, 12, 22 and 57 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding indemnification, such provision is deemed deleted.
- (14) Dispute Resolution: Provisions regarding dispute resolution are set forth in Article 27 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding dispute resolution, such provision is deemed deleted.
- (15) Payment to Other Entities: In the event the Specifications and/or the Contract Drawings contain any provision which requires the Contractor to make payments to an entity other than a subcontractor and/or supplier providing services and/or material for the project, such provision is deemed deleted.
- (16) General Conditions: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the General Conditions, the General Conditions shall prevail.
- (17) Standard Construction Contract: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the City of New York Standard Construction Contract, the City of New York Standard Construction Contract shall prevail.



**SCHEDULE A (FOR PUBLICLY BID PROJECTS)****Contract Requirements**

Various Articles of the Contract refer to requirements which are set forth in Schedule A of the General Conditions. The Schedule set forth below specifies the following: (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to the contract.

REFERENCE	ITEM	REQUIREMENTS	CONTRACT FOR GENERAL CONSTRUCTION
Article 14 Contract	Time of Completion	Consecutive Calendar Days	Milestone 1 – 730 ccd Milestone 2 – 1,095 ccd
Article 15 Contract	Liquidated Damages	For each consecutive calendar day over completion time	Milestone 1 – \$5,000/day Milestone 2 – \$5,000/day \$
Article 17 Contract	Sub- contracts	Not to exceed percent of Contract Price	<b>60%</b>
Article 21 Contract	Retainage	Percent of voucher	If 100% bonds are required <b>5%</b> If 100% bonds are not required, and Contract Price is less than \$500,000 <b>10%</b> If 100% bonds are not required, and Contract Price is more than \$500,000 <b>10%</b>
Article 24 Contract	Maintenance & Guaranty	Percent of Contract Price	<b>1%</b>
Article 77 Contract	MWBE Program	See Subcontractor Utilization Plan in the Bid Booklet	

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART I. Minimum Limits and Special Conditions**

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Commercial General Liability      Art. 22.1.1	\$ 1,000,000 per occurrence \$ 2,000,000 aggregate (applicable separately to this Project)  Additional Insureds: 1. City of New York, including its officials and employees, and  2. <u>Greeley and Hansen, LLC</u> 3. <u>URS/The LiRo Group a Joint Venture</u>
■ Workers' Compensation      Art. 22.1.2 ■ Disability Benefits Insurance      Art. 22.1.2 ■ Employers' Liability      Art. 22.1.3 ■ Jones Act      Art. 22.1.4  ■ U.S. Longshoremen's and Harbor Workers Compensation Act      Art. 22.1.4	Workers' Compensation: Statutory per New York State law without regard to jurisdiction  Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction  Employers' Liability: \$1,000,000 each accident
■ Builders' Risk      Art 22.1.5  <input type="checkbox"/> Installation Floater	Applicable to Builders' Risk or Installation Floater:  _____ 100 _____ % of total value of <b>Work</b>  City of New York and the <b>Contractor</b> named as Loss Payee for the <b>Work</b> in order of precedence, as their interests may appear.  <u>Note:</u> Article 22.1.5 is revised by deleting the following sentence: "Such policy shall name as insureds the City, the Contractor, and its Subcontractors". This deletion applies to Builders' Risk and Installation Floater.

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART I. Minimum Limits and Special Conditions (Continued)**

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Comprehensive Business Auto Coverage Art. 22.1.6	<p>\$ <u>1,000,000</u> per accident</p> <p>If vehicles are used for transporting hazardous materials, the <b>Contractor</b> shall provide pollution liability broadened coverage for covered autos (endorsement CA 99 48) as well as proof of MCS 90</p> <p>Additional Insured: 1. City of New York, including its officials and employees</p>
■ Pollution/Environmental Liability Art. 22.1.7	<p>\$ <u>1,000,000</u> per occurrence</p> <p>\$ <u>2,000,000</u> aggregate</p> <p>Additional Insureds: 1. City of New York, including its officials and employees, and 2. <u>Greeley and Hansen, LLC</u> 3. <u>URS/The LiRo Group a Joint Venture</u></p>
■ Marine Protection and Indemnity Art. 22.1.8(a)	<p>\$ <u>1,000,000</u> per occurrence</p> <p>\$ <u>2,000,000</u> aggregate</p> <p>Additional Insureds: 1. City of New York, including its officials and employees, and 2. <u>Greeley and Hansen, LLC</u> 3. <u>URS/The LiRo Group a Joint Venture</u></p>

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART I. Minimum Limits and Special Conditions (Continued)**

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

<input type="checkbox"/> Ship Repairers Legal Liability      Art. 22.1.8(b)	\$ _____ each occurrence [Contracting agency to fill in total value of City vessels involved]
<input checked="" type="checkbox"/> Collision Liability/Towers Liability Art. 22.1.8(c)	\$ <u>2,000,000</u> per occurrence  \$ <u>4,000,000</u> aggregate  Additional Insureds: 1. City of New York, including its officials and employees, and 2. <u>Greeley and Hansen, LLC</u> 3. <u>URS/The LiRo Group a Joint Venture</u>
<input checked="" type="checkbox"/> Marine Pollution Liability      Art. 22.1.8(d)	\$ <u>1,000,000</u> each occurrence  Additional Insureds: 1. City of New York, including its officials and employees, and 2. <u>Greeley and Hansen, LLC</u> 3. <u>URS/The LiRo Group a Joint Venture</u>
[OTHER]      Art. 22.1.9  <input type="checkbox"/> Railroad Protective Liability      _____	\$ _____ per occurrence  \$ _____ aggregate  Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

### **Relating to Article 22 - Insurance**

**Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.**

**Addendum to the General Conditions  
September 1, 2009**

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART II. Broker's Certification**

[Pursuant to Article 22.3.1(a) of the **Contract**, every Certificate of Insurance must be accompanied by either the following certification by the broker setting forth the following text and required information and signatures or complete copies of all policies referenced in the Certificate of Insurance. In the absence of completed policies, binders are acceptable.]

**CERTIFICATION BY BROKER**

The undersigned insurance broker represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects, and that the described insurance is effective as of the date of this Certification.

\_\_\_\_\_  
[Name of broker (typewritten)]

\_\_\_\_\_  
[Address of broker (typewritten)]

\_\_\_\_\_  
[Signature of authorized official or broker]

\_\_\_\_\_  
[Name and title of authorized official (typewritten)]

Sworn to before me this  
\_\_\_\_ day of \_\_\_\_\_, 201\_\_

\_\_\_\_\_  
NOTARY PUBLIC

**SCHEDULE A (FOR PUBLICLY BID PROJECTS)**

**Relating to Article 22 - Insurance**

**PART III. Address of Commissioner**

Wherever reference is made in Article 7 or Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth below or, in the absence of such address, to the **Commissioner's** address as provided elsewhere in this **Contract**.

ACCO's Office, Insurance Unit

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30-30 Thomson Avenue, 4<sup>th</sup> Floor

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Long Island City, New York 11101

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## **SCHEDULE B**

### **Guarantees and Warranties**

(Reference: Article 1.22 of the General Conditions)

#### **GUARANTY FROM CONTRACTOR**

(1) **Contractor's Guaranty Obligation:** The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract), except for the areas of Work set forth below:

- Roofing and Waterproofing Work. For roofing work and waterproofing work, the guarantee period shall be (2) two years.
- Trees and/or Plant Material. For trees and/or plant material furnished and installed, the guarantee period shall be (2) two years. During the guarantee period, the Contractor shall provide all maintenance services set forth in the Specifications.

(2) **Guaranty Period:** The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.

(3) **Other Provisions Deemed Deleted:** In the event the Specifications and/or the Contract Drawings contain any provisions regarding guaranty requirements, such provisions are deemed deleted and replaced with the guaranty requirements set forth in this Schedule B.

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#### **WARRANTY FROM MANUFACTURER**

(1) **Contractor's Obligation to Provide Warranties:** The items of material and/or equipment for which manufacturer warranties are required are listed below. For each item of material and/or equipment listed below, the Contractor shall obtain a written warranty from the manufacturer. Such warranty shall provide that the material or equipment is free from defects for the period set forth below and will be replaced or repaired within such specified period. The Contractor shall deliver all required warranties to the Commissioner.

(2) **Required Warranties:**

Specification Number	Material or Equipment	Length of Warranty
02396	Elastometric Fenders	10 years
02762	Pavement Markings	6 months
02822	Components of ornamental fences, rails, and gates	2 years
02822	Ornamental fence and gate powder coat and polyurethane finish	10 years
02827	Swing gate operators	5 years
05675	Crane Rail System	2 years
05830	Expansion joint systems	1 year
07140	Waterproofing system	2 years
07141	Surface applied waterproof coatings	5 years
07410	Components of metal wall panel assemblies	2 years
07410	Metal wall panel fluoropolymer finish	20 years



<b>Specification Number</b>	<b>Material or Equipment</b>	<b>Length of Warranty</b>
07410	Metal wall panel weather-tightness	10 years
07610	Sheet metal roofing/siding	20 years
07721	Roof hatch fluoropolymer finish	20 years
07811	Fire resistive materials	2 years
07921	Elastomeric joint sealant	10 years
08342	Overhead high speed fabric doors type 2	5 years
08342	Overhead high speed fabric doors type 1	lifetime
08520	Aluminum windows	3 years
08520	Aluminum windows metal finishes	15 years
08520	Aluminum windows glass	10 years
08630	Translucent insulated panels	5 years
08630	Fiberglass-sandwich-panel	10 years
08630	Translucent insulated panels aluminum finish	20 years
08660	Security screen	1 year
08711	Door hardware	3 years
08711	Door hardware electromagnetic, delayed-egress locks & exit devices	5 years
08711	Door hardware manual closers & concealed floor closers	10 years
08800	Coated glass products & Insulating glass	10 years
08800	Laminated glass	5 years
10200	Finishes on louvers & screens	20 years
10290	Polyethylene netting against UV breakdown	10 years
10436	Porcelain enamel signs	25 years
10436	Dimensional character/medallion sign finish	15 years
10505	Phenolic lockers and benches	3 years
10520	Portable fire extinguishers	6 years
10801	Bathroom mirrors	15 years
10881	Load Cells	5 years
11010	Fall restraint system defects	1 year
11010	Fall restraint system maintenance	1 year
11141	Diesel fuel dispensing system	5 years
11141	Diesel Fuel Piping	lifetime
11142	Fluid dispensing system against electrochemical corrosion	20 years
11211	Service Water System	1 year
11311	Oil water separator	1 year
11451	Domestic-type appliances	5 years
11570	Dust Suppression	1 year
13111	Impressed current-cathodic protection system	1 year
13852	Radiation detection system	3 years
13861	Odor Control Systems	1 year
14512	Containers	1 year
14640	Container Gantry Cranes	3 years
15076	Signs identifying piping/equipment	10 years
15486	Domestic water heater storage tanks	10 years

Specification Number	Material or Equipment	Length of Warranty
15486	Domestic water heater circulators	8 years
15486	Domestic water heater burner assemblies	5 years
15486	Domestic water heater complete heat exchanger assembly	3 years
15551	Chimney automation system	2 years
15551	Chimney automation system fans	10 years
15670	Condensing unit parts	1 year
15720	Air handling units parts	1 year
16122	Medium voltage cables	40 years
16511	Lighting control system computer	3 years
16751	Access control system proximity cards & readers	lifetime
16752	Digital video system	3 years
16122	Medium voltage cables	40 years
16230	Packaged Engine Generator Systems	2 years
16264	Uninterruptible Power Supply System	3 years
16511	Lighting control system computer	3 years
16511	Lighting Control System and Emergency Lighting Extended Warranty	2 years
16751	Access control system proximity cards & readers	Lifetime
16752	Digital video system	3 years

**(3) Application:** The obligations under the warranty for the periods specified above shall apply only to the manufacturer of the material or equipment, and not to the Contractor or its Surety; provided, however, the Contractor retains responsibility for obtaining all required warranties from the manufacturers and delivering the same to the Commissioner.

**(4) Other Provisions:** The warranty requirements set forth in this Schedule B are also included in the Specifications.

- (a) In the event of any conflict between a warranty requirement set forth in the Specifications and a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall take precedence.
- (b) In the event a warranty requirement set forth in the Specifications is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications, shall remain in full force and effect
- (c) In the event a warranty requirement for a particular item of material or equipment is omitted from both Schedule B and the Specifications, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.
- (d) In the event a warranty requirement is provided for a particular item of material or equipment, and such requirement specifies a warranty period that is longer than that which is actually provided by any of the specified manufacturers, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by any of the specified manufacturers, unless otherwise directed in writing by the Commissioner.

## SCHEDULE C

### Contract Drawings

(Reference: Article 1.04(A) of the General Conditions)

The Schedule set forth below lists all Contract Drawings for the Project.

Sheet No.	Drawing No.	Title
<b><u>GENERAL</u></b>		
	G-001.00	COVER SHEET
I	G-002.00	DRAWING INDEX - SHEET 1
II	G-003.00	DRAWING INDEX - SHEET 2
III	G-004.00	DRAWING INDEX - SHEET 3
IV	G-005.00	DRAWING INDEX - SHEET 4
V	G-006.00	SPECIAL INSPECTION TABLES
<b><u>CIVIL/SITE WORK</u></b>		
1	C-001.00	LEGEND, GENERAL NOTES AND ABBREVIATIONS
2	C-002.00	BORING LOCATION PLAN
3	C-003.00	EXISTING BATHYMETRY - OVERALL PLAN
4	C-004.00	EXISTING BATHYMETRY - SHEET 1
5	C-005.00	EXISTING BATHYMETRY - SHEET 2
6	C-006.00	EXISTING BATHYMETRY - SHEET 3
7	C-007.00	SOIL SAMPLING PLAN
8	C-008.00	EXISTING SITE GRADING, PAVING, LANDSCAPING, AND DEMOLITION - OVERALL PLAN
9	C-009.00	EXISTING SITE GRADING, PAVING, LANDSCAPING, AND DEMOLITION - SHEET 1
10	C-010.00	EXISTING SITE GRADING, PAVING, LANDSCAPING, AND DEMOLITION - SHEET 2
11	C-011.00	EXISTING SITE GRADING, PAVING, LANDSCAPING, AND DEMOLITION - SHEET 3
12	C-012.00	EXISTING SITE GRADING, PAVING, LANDSCAPING, AND DEMOLITION - SHEET 4
13	C-013.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - OVERALL PLAN
14	C-014.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - SHEET 1
15	C-015.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - SHEET 2
16	C-016.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - SHEET 3
17	C-017.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - SHEET 4
18	C-018.00	FINAL SITE GRADING, PAVING AND LANDSCAPING - SHEET 5
19	C-019.00	MAIN ENTRANCE, PARTIAL PLAN
20	C-020.00	EXISTING UTILITIES AND UTILITY DEMOLITION - OVERALL PLAN
21	C-021.00	EXISTING UTILITIES AND UTILITY DEMOLITION - SHEET 1
22	C-022.00	EXISTING UTILITIES AND UTILITY DEMOLITION - SHEET 2
23	C-023.00	EXISTING UTILITIES AND UTILITY DEMOLITION - SHEET 3
24	C-024.00	EXISTING UTILITIES AND UTILITY DEMOLITION - SHEET 4
25	C-025.00	FINAL UTILITIES - OVERALL PLAN
26	C-026.00	FINAL UTILITIES - SHEET 1
27	C-027.00	FINAL UTILITIES - SHEET 2
28	C-028.00	FINAL UTILITIES - SHEET 3
29	C-029.00	FINAL UTILITIES - SHEET 4
30	C-030.00	SCHEDULES
31	C-031.00	PIER ACCESS RAMP DETAILS
32	C-032.00	STORM OUTFALL - SHEET 1
33	C-033.00	STORM OUTFALL - SHEET 2
34	C-034.00	CONNECTION TO EXISTING BOX CULVERT
35	C-035.00	STORMWATER TREATMENT SYSTEM
36	C-036.00	OIL WATER SEPARATOR
37	C-037.00	LOOP DETECTOR AND SAW CUT DETAILS
38	C-038.00	SIGN DATA SHEET, STRIPING AND SIGN MOUNTING DETAILS
39	C-039.00	CLEARANCE SIGN DETAILS
40	C-040.00	CARD READER PEDESTAL DETAIL
41	C-041.00	SITE WORK DETAILS
42	C-042.00	SITE WORK DETAILS
43	C-043.00	SITE WORK DETAILS
44	C-044.00	SITE WORK DETAILS

Sheet No.	Drawing No.	Title
45	C-045.00	SITE WORK DETAILS
46	C-046.00	SITE WORK DETAILS
47	C-047.00	SITE WORK DETAILS
48	C-048.00	SITE WORK DETAILS
49	C-049.00	SITE WORK DETAILS
50	C-050.00	SITE WORK DETAILS
<b><u>DREDGING</u></b>		
51	Z-001.00	GENERAL NOTES AND ABBREVIATIONS
52	Z-002.00	DREDGE PLAN
53	Z-003.00	SCOUR PROTECTION PLAN
54	Z-004.00	TYPICAL DREDGE SECTIONS
55	Z-005.00	TYPICAL SCOUR PROTECTION SECTIONS
<b><u>ARCHITECTURAL</u></b>		
56	A-001.00	SYMBOLS AND ABBREVIATIONS
57	A-002.00	GENERAL NOTES, DEPARTMENT OF BUILDING SERVICES NOTES
58	A-003.00	EGRESS DIAGRAM PIER LEVEL
59	A-004.00	EGRESS DIAGRAM LOADING LEVEL
60	A-005.00	EGRESS DIAGRAM TIPPING LEVEL
61	A-006.00	EGRESS DIAGRAM MEZZANINE LEVEL
62	A-007.00	ZONING CALCULATIONS AND DIAGRAMS
63	A-008.00	SITE SURVEY
64	A-109.00	SUB-PIER LEVEL PLAN
65	A-110.00	PIER LEVEL PLAN
66	A-111.00	PIER LEVEL PARTIAL PLAN SHEET 1
67	A-112.00	PIER LEVEL PARTIAL PLAN SHEET 2
68	A-113.00	LOADING LEVEL PLAN
69	A-114.00	LOADING LEVEL PARTIAL PLAN SHEET 1
70	A-115.00	LOADING LEVEL PARTIAL PLAN SHEET 2
71	A-116.00	TIPPING LEVEL PLAN
72	A-117.00	TIPPING LEVEL PARTIAL PLAN SHEET 1
73	A-118.00	TIPPING LEVEL PARTIAL PLAN SHEET 2
74	A-119.00	INTERMEDIATE LEVEL PLAN - SHEET 1
75	A-120.00	MECHANICAL PLATFORM LEVEL PLAN
76	A-121.00	MECHANICAL PLATFORM LEVEL PLAN
77	A-125.00	INTERMEDIATE LEVEL PLAN SHEET 2
78	A-130.00	ROOF PLAN
79	A-131.00	ROOF PARTIAL PLAN SHEET 1
80	A-132.00	ROOF PARTIAL PLAN SHEET 2
81	A-140.00	HVAC DUCT OPENING LOCATIONS - PIER LEVEL PARTIAL PLAN SHEET 1
82	A-141.00	HVAC DUCT OPENING LOCATIONS - PIER LEVEL PARTIAL PLAN SHEET 2
83	A-142.00	HVAC DUCT OPENING LOCATIONS - LOADING LEVEL PARTIAL PLAN SHEET 1
84	A-143.00	HVAC DUCT OPENING LOCATIONS - LOADING LEVEL PARTIAL PLAN SHEET 2
85	A-144.00	HVAC DUCT OPENING LOCATIONS - TIPPING LEVEL PARTIAL PLAN SHEET 1
86	A-145.00	HVAC DUCT OPENING LOCATIONS - TIPPING LEVEL PARTIAL PLAN SHEET 2
87	A-146.00	HVAC DUCT OPENING LOCATIONS - INTERMEDIATE LEVEL PARTIAL PLAN
88	A-147.00	HVAC DUCT OPENING SCHEDULE
89	A-150.00	PIER LEVEL PARTIAL REFLECTED CEILING PLAN
90	A-151.00	PIER, LOADING AND TIPPING LEVELS PARTIAL REFLECTED CEILING PLANS
91	A-200.00	BUILDING ELEVATION - NORTH
92	A-201.00	BUILDING ELEVATION - EAST
93	A-202.00	BUILDING ELEVATION - SOUTH
94	A-203.00	BUILDING ELEVATION - WEST
95	A-220.00	BUILDING SECTION 1
96	A-221.00	BUILDING SECTION 2
97	A-222.00	BUILDING SECTION 3
98	A-223.00	BUILDING SECTION 4
99	A-224.00	BUILDING SECTION 5
100	A-300.00	TIPPING OFFICES PLAN AND ELEVATIONS
101	A-301.00	OPERATIONS ROOM PLAN, ELEVATIONS, WALL SECTIONS
102	A-302.00	TIPPING OFFICES SECTIONS AND DETAILS
103	A-303.00	TIPPING TOILET PLANS, ELEVATIONS, AND DETAILS
104	A-307.00	LIDDING AREA CATWALK ENLARGED PLAN AND SECTIONS
105	A-308.00	PERSONNEL AREA ENLARGED PLANS
106	A-309.00	PERSONNEL AREA ENLARGED PLANS
107	A-310.00	PERSONNEL AREA ELEVATIONS

Sheet No.	Drawing No.	Title
108	A-311.00	PERSONNEL AREA SECTIONS AND ELEVATIONS
109	A-400.00	STAIR A PLANS, SECTIONS
110	A-401.00	STAIR B PLANS, SECTIONS
111	A-402.00	STAIR C PLANS, SECTIONS
112	A-403.00	STAIR D PLANS, SECTIONS
113	A-405.00	STAIR DETAILS
114	A-406.00	STAIR DETAILS
115	A-500.00	MISCELLANEOUS NOTES, FIRE RATING NOTES
116	A-501.00	EXTERIOR WALL SECTIONS
117	A-502.00	EXTERIOR WALL SECTIONS
118	A-503.00	EXTERIOR WALL SECTIONS
119	A-504.00	EXTERIOR WALL SECTIONS
120	A-505.00	INTERIOR WALL SECTIONS
121	A-507.00	TIPPING LEVEL TRUCK ENTRY PLANS AND WALL SECTIONS
122	A-509.00	INTERIOR PLAN DETAILS
123	A-510.00	MISC. PLAN DETAILS
124	A-511.00	EXTERIOR PLAN DETAILS - PRECAST AND METAL WALL PANEL
125	A-512.00	EXTERIOR PLAN DETAILS - PIER SIDE
126	A-513.00	EXTERIOR PLAN DETAILS - RAMP/ENTRANCE
127	A-514.00	EXTERIOR PLAN DETAILS - TRANSLUCENT PANEL
128	A-515.00	INTERIOR SECTION DETAILS
129	A-516.00	INTERIOR SECTION DETAILS
130	A-520.00	EXTERIOR SECTION DETAILS
131	A-521.00	EXTERIOR SECTION DETAILS
132	A-522.00	EXTERIOR SECTION DETAILS
133	A-523.00	EXTERIOR SECTION DETAILS
134	A-524.00	EXTERIOR SECTION DETAILS
135	A-525.00	MONITOR SECTIONS
136	A-526.00	MONITOR SECTIONS
137	A-527.00	MONITOR SECTIONS
138	A-528.00	MONITOR SECTIONS
139	A-529.00	EXTERIOR/ INTERIOR LOUVER SCHEDULE
140	A-530.00	EXTERIOR WINDOW SCHEDULE
141	A-531.00	RAILING DETAILS
142	A-532.00	RAILING DETAILS
143	A-540.00	TYPICAL PRECAST PANELS
144	A-541.00	MEDALLION SIGN & OPERATIONS ROOM DETAILS
145	A-550.00	WALL SECTION DETAILS
146	A-551.00	WALL SECTION DETAILS
147	A-552.00	WALL SECTION DETAILS
148	A-553.00	WALL SECTION DETAILS
149	A-554.00	WALL SECTION DETAILS
150	A-555.00	ENLARGED DETAILS
151	A-556.00	ENLARGED DETAILS
152	A-557.00	EXTERIOR PLAN DETAILS - OPERATIONS ROOM
153	A-558.00	MAINTENANCE AREA ELEVATIONS AND DETAILS
154	A-559.00	MAINTENANCE AREA ELEVATIONS AND DETAILS
155	A-560.00	TRANSFORMER ENCLOSURE DETAILS
156	A-590.00	MOCKUPS
157	A-601.00	WALL TYPES AND DETAILS
158	A-602.00	EXTERIOR-INTERIOR DOOR FRAMES, AND DOOR DETAILS
159	A-603.00	ACCESS CONTROL
160	A-604.00	DOOR AND FRAME SCHEDULE
161	A-610.00	MISCELLANEOUS INTERIOR DETAILS
162	A-720.00	LIDDING AREA ELEVATIONS AND SECTIONS
163	A-800.00	TRANSFORMER FACILITIES PLAN, ELEVATIONS, SECTIONS
164	A-801.00	TRANSFORMER FACILITIES PLAN, ELEVATIONS, SECTIONS
165	A-900.00	ENTRANCE GATE PLAN
166	A-901.00	ENTRANCE GATE ELEVATIONS
167	A-902.00	FENCE AND GATE DETAILS
168	A-903.00	EXTERIOR RAILINGS PLAN
<b><u>STRUCTURAL</u></b>		
169	S-001.00	GENERAL STRUCTURAL NOTES, SYMBOLS AND ABBREVIATIONS
170	S-002.00	STANDARD STRUCTURAL DETAILS - SHEET 1
171	S-003.00	STANDARD STRUCTURAL DETAILS - SHEET 2

Sheet No.	Drawing No.	Title
172	S-004.00	LIVE LOAD DIAGRAMS
173	S-005.00	STANDARD CONCRETE REPAIR DETAILS - SHEET 1
174	S-006.00	STANDARD CONCRETE REPAIR DETAILS - SHEET 2
175	S-010.00	DEMOLITION PLAN OF EXISTING INCINERATOR BASE SLAB AND PILE CAPS
176	S-011.00	DEMOLITION SECTIONS
177	S-100.00	PILE PLAN - OVERALL PLAN
178	S-101.00	PARTIAL PILE PLAN - SHEET 1
179	S-102.00	PARTIAL PILE PLAN - SHEET 2
180	S-103.00	PARTIAL PILE PLAN - SHEET 3
181	S-104.00	PARTIAL PILE PLAN - SHEET 4
182	S-105.00	SUBSTRUCTURE FRAMING PLAN - OVERALL PLAN
183	S-106.00	PARTIAL SUBSTRUCTURE FRAMING PLAN - SHEET 1
184	S-107.00	PARTIAL SUBSTRUCTURE FRAMING PLAN - SHEET 2
185	S-108.00	PARTIAL SUBSTRUCTURE FRAMING PLAN - SHEET 3
186	S-109.00	PARTIAL SUBSTRUCTURE FRAMING PLAN - SHEET 4
187	S-110.00	PIER LEVEL PLAN - OVERALL PLAN
188	S-111.00	PARTIAL PIER LEVEL PLAN - SHEET 1
189	S-112.00	PARTIAL PIER LEVEL PLAN - SHEET 2
190	S-113.00	PARTIAL PIER LEVEL PLAN - SHEET 3
191	S-114.00	PARTIAL PIER LEVEL PLAN - SHEET 4
192	S-120.00	PILE CAP SCHEDULE AND DETAILS
193	S-124.00	CARRIAGE RAIL BEAM SECTIONS
194	S-125.00	CRANE RAIL ANCHORAGE DETAILS
195	S-126.00	CARRIAGE RAIL ANCHORAGE DETAILS
196	S-127.00	GRADE BEAM SCHEDULE AND PLACING DIAGRAM - SHEET 1
197	S-128.00	GRADE BEAM PLACING DIAGRAM - SHEET 2
198	S-129.00	EQUIPMENT PLATFORM PARTIAL PLAN AND SECTIONS
199	S-130.00	CONCRETE SECTIONS AND DETAILS - SHEET 1
200	S-131.00	CONCRETE SECTIONS AND DETAILS - SHEET 2
201	S-132.00	CONCRETE SECTIONS AND DETAILS - SHEET 3
202	S-133.00	CONCRETE SECTIONS AND DETAILS - SHEET 4
203	S-134.00	CONCRETE SECTIONS AND DETAILS - SHEET 5
204	S-135.00	STAIR A - SECTIONS AND DETAILS
205	S-136.00	STAIR B - SECTIONS AND DETAILS
206	S-138.00	STAIR D - SECTIONS AND DETAILS
207	S-139.00	PIER STAIR SECTIONS AND DETAILS
208	S-140.00	GANTRY CRANE BUMPER DETAILS
209	S-141.00	GANTRY CRANE TIE DOWN DETAILS
210	S-150.00	MOORING EQUIPMENT ANCHORAGE DETAILS
211	S-200.00	PARTIAL LOADING FLOOR FRAMING PLAN - SHEET 1
212	S-201.00	PARTIAL LOADING FLOOR FRAMING PLAN - SHEET 2
213	S-202.00	PARTIAL LOADING FLOOR CONCRETE PLAN - SHEET 1
214	S-203.00	PARTIAL LOADING FLOOR CONCRETE PLAN - SHEET 2
215	S-204.00	LOADING FLOOR SLAB TYPES PLAN
216	S-205.00	LOADING FLOOR CONCRETE TOPPING PLAN
217	S-206.00	PARTIAL CONCEALED SPACE PLAN
218	S-210.00	PARTIAL TIPPING FLOOR FRAMING PLAN - SHEET 1
219	S-211.00	PARTIAL TIPPING FLOOR FRAMING PLAN - SHEET 2
220	S-212.00	PARTIAL TIPPING FLOOR CONCRETE PLAN - SHEET 1
221	S-213.00	PARTIAL TIPPING FLOOR CONCRETE PLAN - SHEET 2
222	S-214.00	TIPPING FLOOR OFFICE FRAMING PLANS
223	S-215.00	MAINTENANCE BAY - PARTIAL PLANS
224	S-216.00	TIPPING FLOOR SLAB TYPES PLAN
225	S-217.00	TIPPING FLOOR CONCRETE TOPPING PLAN
226	S-220.00	MEZZANINE FRAMING PLAN
227	S-230.00	PARTIAL BOTTOM CHORD ROOF FRAMING PLAN - SHEET 1
228	S-231.00	PARTIAL BOTTOM CHORD ROOF FRAMING PLAN - SHEET 2
229	S-240.00	PARTIAL TOP CHORD ROOF FRAMING - SHEET 1
230	S-241.00	PARTIAL TOP CHORD ROOF FRAMING - SHEET 2
231	S-242.00	ROOF MONITOR AND CRANE POWER RAIL SUPPORT FRAMING PLANS
232	S-260.00	PARTIAL BOTTOM CHORD HVAC SUPPORT FRAMING PLAN - SHEET 1
233	S-261.00	PARTIAL BOTTOM CHORD HVAC SUPPORT FRAMING PLAN - SHEET 2
234	S-262.00	PARTIAL TOP CHORD HVAC SUPPORT FRAMING PLAN - SHEET 1
235	S-263.00	PARTIAL TOP CHORD HVAC SUPPORT FRAMING PLAN - SHEET 2
236	S-264.00	MONITOR PLAN FOR DUCT SUPPORT FRAMING PLAN
237	S-300.00	TRANSVERSE SECTION

Sheet No.	Drawing No.	Title
238	S-301.00	TRANSVERSE SECTION
239	S-302.00	LONGITUDINAL SECTION
240	S-303.00	LONGITUDINAL SECTION
241	S-304.00	LONGITUDINAL SECTION
242	S-310.00	ELEVATION - COLUMN LINE A
243	S-311.00	ELEVATION - COLUMN LINE B
244	S-312.00	ELEVATION - COLUMN LINE C
245	S-313.00	ELEVATION - COLUMN LINE D
246	S-314.00	ELEVATION - COLUMN LINE E
247	S-315.00	ELEVATION - COLUMN LINE F
248	S-316.00	ELEVATIONS - COLUMN LINES G, H
249	S-317.00	ELEVATION - COLUMN LINE 1
250	S-318.00	ELEVATION - COLUMN LINE 17
251	S-319.00	OPERATIONS ROOM - GIRT ELEVATIONS, SECTIONS AND DETAILS
252	S-320.00	TRUSS ELEVATIONS
253	S-322.00	MONITOR FRAME ELEVATIONS - SHEET 1
254	S-323.00	MONITOR FRAME ELEVATIONS - SHEET 2
255	S-350.00	COLUMN SCHEDULE
256	S-351.00	COLUMN DETAILS
257	S-360.00	SHEARWALL SCHEDULE AND DETAILS
258	S-370.00	SHEARWALL SECTIONS - SHEET 1
259	S-371.00	SHEARWALL SECTIONS - SHEET 2
260	S-372.00	SHEARWALL SECTIONS - SHEET 3
261	S-380.00	SLAB SECTIONS - SHEET 1
262	S-381.00	SLAB SECTIONS - SHEET 2
263	S-382.00	SLAB SECTIONS - SHEET 3
264	S-383.00	SLAB SECTIONS - SHEET 4
265	S-384.00	SLAB SECTIONS - SHEET 5
266	S-385.00	TIPPING FLOOR SCALE - PLAN, SECTIONS AND DETAILS
267	S-410.00	STRUCTURAL SECTIONS AND DETAILS - SHEET 1
268	S-411.00	STRUCTURAL SECTIONS AND DETAILS - SHEET 2
269	S-420.00	TIPPING FLOOR OFFICE SECTIONS AND DETAILS - SHEET 1
270	S-421.00	TIPPING FLOOR OFFICE SECTIONS AND DETAILS - SHEET 2
271	S-422.00	TIPPING FLOOR OFFICE SECTIONS AND DETAILS - SHEET 3
272	S-423.00	FLOOR FRAMING CONNECTION DETAILS
273	S-430.00	OPERATIONS ROOM SECTIONS AND DETAILS - SHEET 1
274	S-431.00	OPERATIONS ROOM SECTIONS AND DETAILS - SHEET 2
275	S-432.00	OPERATIONS ROOM SECTIONS AND DETAILS - SHEET 3
276	S-433.00	OPERATIONS ROOM SECTIONS AND DETAILS - SHEET 4
277	S-434.00	ROOF FRAMING SECTIONS AND DETAILS
278	S-450.00	STAIR A PLANS AND SECTION
279	S-451.00	STAIR A SECTIONS
280	S-452.00	STAIR A SECTIONS
281	S-453.00	HVAC SHAFT A
282	S-454.00	STAIR B PLAN AND SECTION
283	S-455.00	STAIR B SECTIONS
284	S-456.00	STAIR B SECTIONS
285	S-457.00	HVAC SHAFTS B AND C
286	S-458.00	STAIR E PLANS AND SECTIONS
287	S-459.00	STAIR E DETAILS
288	S-460.00	STAIR F PLAN AND SECTIONS
289	S-500.00	GIRT SECTIONS AND DETAILS - SHEET 1
290	S-501.00	GIRT SECTIONS AND DETAILS - SHEET 2
291	S-502.00	GIRT SECTIONS AND DETAILS - SHEET 3
292	S-503.00	GIRT SECTIONS AND DETAILS - SHEET 4
293	S-504.00	GIRT SECTIONS AND DETAILS - SHEET 5
294	S-505.00	GIRT SECTIONS AND DETAILS - SHEET 6
295	S-506.00	GIRT SECTIONS AND DETAILS - SHEET 7
296	S-507.00	MAINTENANCE BAY SECTIONS AND DETAILS - SHEET 1
297	S-508.00	MAINTENANCE BAY SECTIONS AND DETAILS - SHEET 2
298	S-509.00	MAINTENANCE BAY SECTIONS AND DETAILS - SHEET 3
299	S-510.00	ROOF TRUSS AND MEZZANINE CONNECTION DETAILS
300	S-511.00	TYPICAL BRACING CONNECTION DETAILS - SHEET 1
301	S-512.00	TYPICAL BRACING CONNECTION DETAILS - SHEET 2
302	S-513.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 1
303	S-514.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 2

Sheet No.	Drawing No.	Title
304	S-515.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 3
305	S-516.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 4
306	S-517.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 5
307	S-518.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 6
308	S-519.00	TRUSS AND BRACING CONNECTION DETAILS - SHEET 7
309	S-540.00	ROOF MONITORS SECTIONS AND DETAILS - SHEET 1
310	S-541.00	ROOF MONITORS SECTIONS AND DETAILS - SHEET 2
311	S-542.00	ROOF MONITORS SECTIONS AND DETAILS - SHEET 3
312	S-543.00	ROOF MONITORS SECTIONS AND DETAILS - SHEET 4
313	S-560.00	DUCT HANGERS AND SAG RODS SECTIONS
314	S-570.00	WALL PANEL CLOSURE DETAILS - SHEET 1
315	S-571.00	WALL PANEL CLOSURE DETAILS - SHEET 2
316	S-572.00	WALL PANEL CLOSURE DETAILS - SHEET 3
317	S-573.00	WALL PANEL CLOSURE DETAILS - SHEET 4
318	S-574.00	WALL PANEL CLOSURE DETAILS - SHEET 5
319	S-600.00	TRANSFORMER VAULT FOUNDATION PLANS
320	S-601.00	TRANSFORMER VAULT PLANS
321	S-602.00	TRANSFORMER VAULT SECTIONS
322	S-603.00	TRANSFORMER VAULT LOUVER DETAILS
323	S-604.00	TRANSFORMER VAULT SECTIONS
324	S-610.00	SITE STRUCTURES - PLANS, SECTIONS AND DETAILS
325	S-800.00	BULKHEAD PLAN
326	S-801.00	BULKHEAD DETAILS - SHEET 1
327	S-802.00	BULKHEAD DETAILS - SHEET 2
328	S-803.00	BULKHEAD DETAILS - SHEET 3
329	S-804.00	BULKHEAD DETAILS - SHEET 4
330	S-900.00	FENDER SYSTEM PARTIAL PLAN - SHEET 1
331	S-901.00	FENDER SYSTEM PARTIAL PLAN - SHEET 2
332	S-902.00	EXISTING FENDER SYSTEM - DEMOLITION DETAILS
333	S-903.00	FENDER SYSTEM DETAILS - SHEET 1
334	S-904.00	FENDER SYSTEM DETAILS - SHEET 2
335	S-905.00	FENDER SYSTEM DETAILS - SHEET 3
<b>RAMP STRUCTURE</b>		
336	R-001.00	STRUCTURAL NOTES AND ABBREVIATIONS
337	R-002.00	ALIGNMENT PLAN
338	R-003.00	PROFILES
339	R-004.00	GRADING PLAN
340	R-005.00	PLAN AND ELEVATION
341	R-006.00	SECTIONS - 1
342	R-007.00	SECTIONS - 2
343	R-011.00	FOUNDATION PLAN
344	R-012.00	APPROACH STRUCTURE FOUNDATION PLAN AND REINFORCEMENT DETAILS
345	R-013.00	APPROACH STRUCTURE SECTIONS
346	R-014.00	APPROACH STRUCTURE REINFORCEMENT DETAILS
347	R-015.00	APPROACH STRUCTURE WEIGHING SCALE FOUNDATION DETAILS - 1
348	R-016.00	APPROACH STRUCTURE WEIGHING SCALE FOUNDATION DETAILS - 2
349	R-017.00	ABUTMENT DETAILS
350	R-018.00	M.S.E.S. WALL DETAILS
351	R-031.00	PIER PT1 DETAILS
352	R-032.00	PIERS PT2 AND PT5 DETAILS
353	R-033.00	PIER PT3 DETAILS
354	R-034.00	PIERS PL1 AND PT4 DETAILS - 1
355	R-035.00	PIERS PL1 AND PT4 DETAILS - 2
356	R-036.00	PIERS PL2, PL3 AND PL4 DETAILS
357	R-037.00	PIER REINFORCEMENT DETAILS - 1
358	R-038.00	PIER REINFORCEMENT DETAILS - 2
359	R-039.00	PIER REINFORCEMENT DETAILS - 3
360	R-040.00	PIER REINFORCEMENT DETAILS - 4
361	R-041.00	PILE CAP DETAILS
362	R-051.00	SUPERSTRUCTURE PLAN - 1
363	R-052.00	SUPERSTRUCTURE PLAN - 2
364	R-053.00	SUPERSTRUCTURE PLAN - 3
365	R-054.00	SUPERSTRUCTURE PLAN - 4
366	R-055.00	SUPERSTRUCTURE SECTIONS - 1
367	R-056.00	SUPERSTRUCTURE SECTIONS - 2



Sheet No.	Drawing No.	Title
368	R-057.00	BOX GIRDER DETAILS - 1
369	R-058.00	BOX GIRDER DETAILS - 2
370	R-061.00	BOX GIRDER TOP SLAB REINFORCEMENT DETAILS - 1
371	R-062.00	BOX GIRDER TOP SLAB REINFORCEMENT DETAILS - 2
372	R-063.00	BOX GIRDER BOTTOM SLAB REINFORCEMENT DETAILS - 1
373	R-064.00	BOX GIRDER BOTTOM SLAB REINFORCEMENT DETAILS - 2
374	R-065.00	BOX GIRDER WEB REINFORCEMENT DETAILS
375	R-066.00	BOX GIRDER SECTION REINFORCEMENT DETAILS - 1
376	R-067.00	BOX GIRDER SECTION REINFORCEMENT DETAILS - 2
377	R-071.00	BARRIER DETAILS
378	R-072.00	JOINT DETAILS - 1
379	R-073.00	JOINT DETAILS - 2
380	R-074.00	MISCELLANEOUS CONCRETE DETAILS - 1
381	R-075.00	MISCELLANEOUS CONCRETE DETAILS - 2
382	R-081.00	GUIDED EXPANSION BEARING DETAILS
383	R-082.00	FIXED BEARING DETAILS
384	R-083.00	MISCELLANEOUS DETAILS - 1
385	R-084.00	MISCELLANEOUS DETAILS - 2
386	R-091.00	PILE DETAILS
387	R-101.00	PAVEMENT MARKING AND SIGNAGE PLAN
388	R-102.00	SIGN DATA SHEET, STRIPING AND SIGN MOUNTING DETAILS
389	R-201.00	STRUCTURAL NOTES AND ABBREVIATIONS
390	R-202.00	ALIGNMENT PLAN
391	R-203.00	PROFILES
392	R-204.00	GRADING PLAN
393	R-205.00	PLAN AND ELEVATION
394	R-206.00	SECTIONS - 1
395	R-207.00	SECTIONS - 2
396	R-211.00	FOUNDATION PLAN
397	R-212.00	APPROACH STRUCTURE FOUNDATION PLAN AND REINFORCEMENT DETAILS
398	R-213.00	APPROACH STRUCTURE SECTIONS
399	R-214.00	APPROACH STRUCTURE REINFORCEMENT DETAILS
400	R-215.00	APPROACH STRUCTURE WEIGHING SCALE FOUNDATION DETAILS - 1
401	R-216.00	APPROACH STRUCTURE WEIGHING SCALE FOUNDATION DETAILS - 2
402	R-218.00	M.S.E.S. WALL DETAILS
403	R-232.00	PIER PT5 DETAILS
404	R-233.00	PIER PT3 DETAILS
405	R-234.00	PIERS PL1 AND PT4 DETAILS - 1
406	R-235.00	PIERS PL1 AND PT4 DETAILS - 2
407	R-236.00	PIERS PL2, PL3 AND PL4 DETAILS
408	R-238.00	PIER REINFORCEMENT DETAILS - 1
409	R-239.00	PIER REINFORCEMENT DETAILS - 2
410	R-240.00	PIER REINFORCEMENT DETAILS - 3
411	R-241.00	PILE CAP DETAILS
412	R-251.00	SUPERSTRUCTURE PLAN - 1
413	R-252.00	SUPERSTRUCTURE PLAN - 2
414	R-253.00	SUPERSTRUCTURE PLAN - 3
415	R-254.00	SUPERSTRUCTURE PLAN - 4
416	R-255.00	SUPERSTRUCTURE SECTIONS - 1
417	R-256.00	SUPERSTRUCTURE SECTIONS - 2
418	R-257.00	BOX GIRDER DETAILS - 1
419	R-258.00	BOX GIRDER DETAILS - 2
420	R-262.00	BOX GIRDER TOP SLAB REINFORCEMENT DETAILS
421	R-264.00	BOX GIRDER BOTTOM SLAB REINFORCEMENT DETAILS
422	R-265.00	BOX GIRDER WEB REINFORCEMENT DETAILS
423	R-266.00	BOX GIRDER SECTION REINFORCEMENT DETAILS - 1
424	R-267.00	BOX GIRDER SECTION REINFORCEMENT DETAILS - 2
425	R-271.00	BARRIER DETAILS
426	R-272.00	JOINT DETAILS - 1
427	R-273.00	JOINT DETAILS - 2
428	R-274.00	MISCELLANEOUS CONCRETE DETAILS - 1
429	R-275.00	MISCELLANEOUS CONCRETE DETAILS - 2
430	R-281.00	GUIDED EXPANSION BEARING DETAILS
431	R-282.00	FIXED BEARING DETAILS
432	R-283.00	MISCELLANEOUS DETAILS - 1
433	R-284.00	MISCELLANEOUS DETAILS - 2

Sheet No.	Drawing No.	Title
434	R-291.00	PILE DETAILS
435	R-301.00	PAVEMENT MARKING AND SIGNAGE PLAN
436	R-302.00	SIGN DATA SHEET, STRIPING AND SIGN MOUNTING DETAILS
<b><u>MECHANICAL</u></b>		
437	M-001.00	LEGEND, ABBREVIATIONS AND GENERAL NOTES
438	M-110.00	PIER LEVEL OVERALL PLAN
439	M-111.00	PIER LEVEL PARTIAL PLAN - SHEET 1
440	M-112.00	PIER LEVEL PARTIAL PLAN - SHEET 2
441	M-113.00	PIER LEVEL PARTIAL PLAN - SHEET 3
442	M-114.00	PIER LEVEL ODOR CONTROL ROOM ENLARGED PLAN
443	M-120.00	LOADING LEVEL OVERALL PLAN
444	M-121.00	LOADING LEVEL PARTIAL PLAN - SHEET 1
445	M-122.00	LOADING LEVEL PARTIAL PLAN - SHEET 2
446	M-123.00	LOADING LEVEL LIDDING AREA ENLARGED PLAN
447	M-124.00	LOADING LEVEL MAINTENANCE BAY ENLARGED PLAN & DETAILS
448	M-130.00	TIPPING LEVEL OVERALL PLAN
449	M-131.00	TIPPING LEVEL PARTIAL PLAN - SHEET 1
450	M-132.00	TIPPING LEVEL PARTIAL PLAN - SHEET 2
451	M-133.00	TIPPING LEVEL INBOUND SCALE AREA ENLARGED PLAN
452	M-134.00	TIPPING LEVEL MAINTENANCE BAY ENLARGED PLAN
453	M-140.00	MEZZANINE LEVEL OVERALL PLAN
454	M-141.00	MEZZANINE LEVEL PARTIAL PLAN - SHEET 1
455	M-142.00	MEZZANINE LEVEL PARTIAL PLAN - SHEET 2
456	M-210.00	SECTION - SHEET 1
457	M-211.00	SECTION - SHEET 2
458	M-212.00	SECTION AND DETAIL - SHEET 3
459	M-213.00	SECTION - SHEET 4
460	M-214.00	SECTION AND DETAIL - SHEET 5
461	M-215.00	SECTION - SHEET 6
462	M-216.00	SECTIONS - SHEET 7
463	M-217.00	SECTIONS AND DETAILS - SHEET 8
464	M-218.00	SECTION AND DETAILS - SHEET 9
465	M-219.00	DIESEL FUEL DISPENSING SYSTEM PLAN, SECTIONS, & SCHEMATIC DIAGRAM
466	M-220.00	PIER LEVEL SECTIONS - SHEET 10
467	M-310.00	DUST SUPPRESSION AND ODOR CONTROL ONE LINE DIAGRAMS
468	M-311.00	SERVICE WATER ONE LINE DIAGRAM
469	M-312.00	HEAT TRACING DIAGRAM AND MOTOR OIL DISPENSING SYSTEM SCHEMATIC
470	M-313.00	CONTAINER TRANSPORT CHARGING SYSTEM DETAILS
471	M-410.00	CONTAINER TRANSPORT SYSTEM
472	M-411.00	MARINE HARDWARE DETAILS - SHEET 1
473	M-412.00	MARINE HARDWARE DETAILS - SHEET 2
474	M-413.00	MARINE HARDWARE DETAILS - SHEET 3
475	M-414.00	MARINE HARDWARE DETAILS - SHEET 4
476	M-415.00	MARINE HARDWARE DETAILS - SHEET 5
477	M-416.00	MOORING FITTINGS - SHEET 1
478	M-417.00	CONSTANT TENSION MOORING WINCH - SHEET 1
479	M-418.00	MOORING CAPSTAN - SHEET 1
480	M-419.00	PAINT MARKING AND SIGNAGE, CRANE SECTION - SHEET 1
481	M-420.00	PAINT MARKING AND SIGNAGE, BARGE PLAN VIEW - SHEET 1
482	M-510.00	BLOCK DIAGRAMS - SHEET 1
483	M-511.00	BLOCK DIAGRAMS - SHEET 2
484	M-512.00	BLOCK DIAGRAMS - SHEET 3
485	M-513.00	BLOCK DIAGRAMS - SHEET 4
486	M-514.00	BLOCK DIAGRAMS - SHEET 5
487	M-515.00	BLOCK DIAGRAMS - SHEET 6
488	M-516.00	BLOCK DIAGRAMS - SHEET 7
489	M-517.00	BLOCK DIAGRAMS - SHEET 8
490	M-518.00	CONTROL ROOM LAYOUTS
491	M-519.00	MOUNTING DETAILS - SHEET 1
492	M-520.00	MOUNTING DETAILS - SHEET 2
493	M-521.00	MOUNTING DETAILS - SHEET 3
494	M-522.00	SCALE DATA NETWORK
495	M-610.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP PIER LEVEL OVERALL PLAN
496	M-611.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP PIER LEVEL PARTIAL PLAN - SHEET 1

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497	M-612.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP PIER LEVEL PARTIAL PLAN - SHEET 2
498	M-613.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP PIER LEVEL PARTIAL PLAN - SHEET 3
499	M-614.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP LOADING LEVEL OVERALL PLAN
500	M-615.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP LOADING LEVEL PARTIAL PLAN - SHEET 1
501	M-616.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP LOADING LEVEL PARTIAL PLAN - SHEET 2
502	M-617.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP TIPPING LEVEL OVERALL PLAN
503	M-618.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP TIPPING LEVEL PARTIAL PLAN - SHEET 1
504	M-619.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP TIPPING LEVEL PARTIAL PLAN - SHEET 2
505	M-620.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP RAMP ENLARGED PARTIAL PLAN
506	M-630.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP SECTIONS - SHEET 1
507	M-631.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP SECTIONS - SHEET 2
508	M-632.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP SECTIONS - SHEET 3
509	M-640.00	PAINT MARKING, SIGNAGE AND SAFETY EQUIP SIGNAGE SCHEDULE
<b><u>GANTRY CRANE</u></b>		
510	T-001.00	LEGEND, GENERAL NOTES AND ABBREVIATIONS
511	T-002.00	CRANE OUTLINE DRAWING - SHEET 1
512	T-003.00	CRANE OUTLINE DRAWING - SHEET 2
513	T-004.00	CRANE OUTLINE DRAWING - SHEET 3
514	T-005.00	LIMIT SWITCH & ANTI-COLLISION SYSTEM - SHEET 1
515	T-006.00	LIMIT SWITCH & ANTI-COLLISION SYSTEM - SHEET 2
516	T-007.00	ELECTRICAL CONDUCTOR BAR SYSTEM - COMPONENTS
517	T-008.00	CRANE MANAGEMENT SYSTEM - CRANE LOADOUT SEQUENCE
518	T-009.00	MECHANICAL PAINT MARKING AND SIGNAGE - CONTAINER GANTRY CRANE
519	T-010.00	CONTAINER TOLERANCES AND CLEARANCES
520	T-011.00	AERIAL VIEW
521	T-012.00	GANTRY CRANE - SHEET 1
522	T-013.00	GANTRY CRANE - SHEET 2
523	T-014.00	GANTRY CRANE - SHEET 3
524	T-015.00	GANTRY CRANE - SHEET 4
<b><u>HVAC</u></b>		
525	H-001.00	SYMBOLS AND ABBREVIATIONS
526	H-002.00	AIR FLOW DIAGRAMS - SHEET 1
527	H-003.00	AIR FLOW DIAGRAMS - SHEET 2
528	H-004.00	AIR FLOW DIAGRAMS - SHEET 3
529	H-100.00	PIER LEVEL OVERALL PLAN
530	H-101.00	PIER LEVEL PARTIAL PLAN - SHEET 1
531	H-102.00	PIER LEVEL PARTIAL PLAN - SHEET 2
532	H-103.00	LOADING LEVEL OVERALL PLAN
533	H-104.00	LOADING LEVEL PARTIAL PLAN
534	H-105.00	TIPPING LEVEL OVERALL PLAN
535	H-106.00	TIPPING LEVEL PARTIAL PLAN
536	H-107.00	MEZZANINE LEVEL OVERALL PLAN
537	H-108.00	MEZZANINE LEVEL PARTIAL PLAN - SHEET 1
538	H-109.00	MEZZANINE LEVEL PARTIAL PLAN - SHEET 2
539	H-110.00	PARTIAL PLANS
540	H-111.00	TRANSFORMER FACILITY PLAN AND SECTION
541	H-200.00	SECTION - SHEET 1
542	H-201.00	SECTION - SHEET 2
543	H-202.00	SECTION - SHEET 3
544	H-203.00	SECTION - SHEET 4
545	H-204.00	SECTION - SHEET 5
546	H-205.00	SECTION - SHEET 6
547	H-206.00	SECTIONS - SHEET 7
548	H-207.00	SECTIONS - SHEET 8
549	H-300.00	TYPICAL DETAILS - SHEET 1
550	H-301.00	TYPICAL DETAILS - SHEET 2
551	H-400.00	SCHEDULES - SHEET 1
552	H-401.00	SCHEDULES - SHEET 2
<b><u>PLUMBING</u></b>		
553	P-001.00	PLUMBING - SYMBOLS & ABBREVIATIONS
554	P-002.00	PLUMBING - GENERAL NOTES & NYC BUILDING DEPARTMENT NOTES

Sheet No.	Drawing No.	Title
555	P-010.00	PLUMBING - UNDERGROUND PIPING PARTIAL PLAN - SHEET 1
556	P-011.00	PLUMBING - UNDERGROUND PIPING PARTIAL PLAN - SHEET 2
557	P-012.00	PLUMBING - UNDERGROUND PIPING PARTIAL PLAN - SHEET 3
558	P-013.00	PLUMBING - PIER LEVEL PARTIAL PLAN - SHEET 1
559	P-014.00	PLUMBING - PIER LEVEL PARTIAL PLAN - SHEET 2
560	P-015.00	PLUMBING - PIER LEVEL PARTIAL PLAN - SHEET 3
561	P-020.00	PLUMBING - LOADING LEVEL PARTIAL PLAN - SHEET 1
562	P-021.00	PLUMBING - LOADING LEVEL PARTIAL PLAN - SHEET 2
563	P-030.00	PLUMBING - TIPPING LEVEL PARTIAL PLAN - SHEET 1
564	P-031.00	PLUMBING - TIPPING LEVEL PARTIAL PLAN - SHEET 2
565	P-040.00	PLUMBING - MEZZANINE PARTIAL PLAN - SHEET 1
566	P-041.00	PLUMBING - MEZZANINE PARTIAL PLAN - SHEET 2
567	P-050.00	PLUMBING - ROOF PLAN
568	P-060.00	PLUMBING - DETAILS 1
569	P-061.00	PLUMBING - DETAILS 2
570	P-062.00	PLUMBING - DETAILS 3
571	P-063.00	PLUMBING - DETAILS 4
572	P-064.00	PLUMBING - DETAILS 5
573	P-065.00	PLUMBING - DETAILS 6
574	P-066.00	PLUMBING - DETAILS 7
575	P-070.00	PLUMBING - SANITARY RISER DIAGRAM - SHEET 1
576	P-071.00	PLUMBING - SANITARY RISER DIAGRAM - SHEET 2
577	P-072.00	PLUMBING - STORM WATER RISER DIAGRAM
578	P-073.00	PLUMBING - INDUSTRIAL WASTE RISER DIAGRAM - SHEET 1
579	P-074.00	PLUMBING - INDUSTRIAL WASTE RISER DIAGRAM - SHEET 2
580	P-075.00	PLUMBING - DOMESTIC WATER RISER DIAGRAM - SHEET 1
581	P-076.00	PLUMBING - DOMESTIC WATER RISER DIAGRAM - SHEET 2
582	P-077.00	PLUMBING - GAS RISER DIAGRAM
583	P-080.00	PLUMBING - SCHEDULES
584	P-201.00	FIRE PROTECTION - SYMBOLS & ABBREVIATIONS
585	P-202.00	FIRE PROTECTION - GENERAL NOTES & NYC BUILDING DEPARTMENT NOTES
586	P-210.00	FIRE PROTECTION - PIER LEVEL PARTIAL PLAN - SHEET 1
587	P-211.00	FIRE PROTECTION - PIER LEVEL PARTIAL PLAN - SHEET 2
588	P-220.00	FIRE PROTECTION - LOADING LEVEL PARTIAL PLAN - SHEET 1
589	P-221.00	FIRE PROTECTION - LOADING LEVEL PARTIAL PLAN - SHEET 2
590	P-230.00	FIRE PROTECTION - TIPPING LEVEL PARTIAL PLAN- SHEET 1
591	P-231.00	FIRE PROTECTION - TIPPING LEVEL PARTIAL PLAN- SHEET 2
592	P-232.00	FIRE PROTECTION - MEZZANINE PLAN
593	P-240.00	FIRE PROTECTION - CEILING PARTIAL PLAN- SHEET 1
594	P-241.00	FIRE PROTECTION - CEILING PARTIAL PLAN - SHEET 2
595	P-250.00	FIRE PROTECTION - FIRE PUMP ROOM ENLARGED PLAN & SECTIONS
596	P-260.00	FIRE PROTECTION - DETAILS 1
597	P-261.00	FIRE PROTECTION - DETAILS 2
598	P-262.00	FIRE PROTECTION - DETAILS 3
599	P-270.00	FIRE PROTECTION - RISER DIAGRAM - SHEET 1
600	P-271.00	FIRE PROTECTION - RISER DIAGRAM - SHEET 2
601	P-280.00	FIRE PROTECTION - SCHEDULES

#### **ELECTRICAL**

602	E-001.00	SYMBOLS, ABBREVIATIONS AND GENERAL NOTES
603	E-101.00	480V SWITCHGEAR ONE LINE DIAGRAM
604	E-102.00	480V SWITCHGEAR FRONT ELEVATION AND PLAN VIEW
605	E-103.00	480V MOTOR CONTROL CENTER F-MCC-01 ONE LINE DIAGRAM SHEET 1
606	E-104.00	480V MOTOR CONTROL CENTER F-MCC-01 ONE LINE DIAGRAM SHEET 2
607	E-105.00	480V MOTOR CONTROL CENTER F-MCC-02 ONE LINE DIAGRAM SHEET 1
608	E-106.00	480V MOTOR CONTROL CENTER F-MCC-02 ONE LINE DIAGRAM SHEET 2
609	E-107.00	480V MOTOR CONTROL CENTER F-MCC-02 ONE LINE DIAGRAM SHEET 3
610	E-108.00	480V MOTOR CONTROL CENTER F-MCC-03 ONE LINE DIAGRAM SHEET 1
611	E-109.00	480V MOTOR CONTROL CENTER F-MCC-03 ONE LINE DIAGRAM SHEET 2
612	E-110.00	SCHEMATIC DIAGRAMS SHEET 1
613	E-111.00	SCHEMATIC DIAGRAMS SHEET 2
614	E-112.00	SCHEMATIC DIAGRAMS SHEET 3
615	E-113.00	SCHEMATIC DIAGRAMS SHEET 4
616	E-114.00	SCHEMATIC DIAGRAMS SHEET 5
617	E-115.00	SCHEMATIC DIAGRAMS SHEET 6
618	E-121.00	CABLE & CONDUIT SCHEDULES SHEET 1
619	E-122.00	CABLE & CONDUIT SCHEDULES SHEET 2

Sheet No.	Drawing No.	Title
620	E-201.00	SITE LIGHTING & POWER PLAN SHEET 1
621	E-202.00	SITE LIGHTING & POWER PLAN SHEET 2
622	E-203.00	SITE LIGHTING DETAILS
623	E-204.00	CON EDISON BLOCKHOUSE - LIGHTING, POWER AND GROUNDING PLAN
624	E-205.00	ENLARGED PLAN OF OUTBOUND SCALE
625	E-301.00	POWER - PIER LEVEL PARTIAL PLAN SHEET 1
626	E-302.00	POWER - PIER LEVEL PARTIAL PLAN SHEET 2
627	E-303.00	POWER - PIER LEVEL PARTIAL PLAN SHEET 3
628	E-304.00	POWER - LOADING LEVEL PARTIAL PLAN SHEET 1
629	E-305.00	POWER - LOADING LEVEL PARTIAL PLAN SHEET 2
630	E-306.00	POWER - TIPPING LEVEL PARTIAL PLAN SHEET 1
631	E-307.00	POWER - TIPPING LEVEL PARTIAL PLAN SHEET 2
632	E-308.00	POWER - INTERMEDIATE LEVEL PARTIAL PLAN
633	E-309.00	POWER - MECHANICAL PLATFORM LEVEL PARTIAL PLAN
634	E-310.00	POWER - LIGHTNING PROTECTION EQUIPMENT DETAILS
635	E-311.00	POWER - LIGHTNING PROTECTION & GROUNDING PIER LEVEL OVERALL PLAN
636	E-312.00	POWER - LIGHTNING PROTECTION ROOF OVERALL PLAN
637	E-313.00	POWER - LIGHTNING PROTECTION SECTIONS
638	E-314.00	POWER - PANEL SCHEDULES
639	E-315.00	POWER - MISCELLANEOUS SECTIONS & DETAILS SHEET 1
640	E-316.00	POWER - MISCELLANEOUS SECTIONS & DETAILS SHEET 2
641	E-317.00	POWER - MISCELLANEOUS SECTIONS & DETAILS SHEET 3
642	E-318.00	POWER - MISCELLANEOUS SECTIONS & DETAILS SHEET 4
643	E-319.00	POWER - EMERGENCY DISTRIBUTION SYSTEM
644	E-339.00	#343580, TRANSFORMER VAULT SECTIONS
645	E-340.00	#343581, TRANSFORMER VAULT SECTIONS AND DETAILS
646	E-341.00	#343582, DIVISION OF RESPONSIBILITY
647	E-342.00	#343583, TRANSFORMER VAULT STRUCTURAL 1 OF 3
648	E-343.00	#343584, TRANSFORMER VAULT STRUCTURAL 2 OF 3
649	E-344.00	#350764, MANHATTAN STRUCTURAL 3 OF 3
650	E-345.00	#351052 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (PLAN)
651	E-346.00	#351053 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (SECTION A-A)
652	E-347.00	#351054 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (SECTION B-B, C-C, D-D, E-E)
653	E-348.00	#351055 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (DETAILS)
654	E-349.00	#351056 PHYSICAL TRANSFORMER CONNECTION & NETWORK PROTECTOR INSTALLATION (DETAILS 30 THRU 38)
655	E-350.00	CONTROL & INSTRUMENTATION - PIER LEVEL PARTIAL PLAN - SHEET 1
656	E-351.00	CONTROL & INSTRUMENTATION - PIER LEVEL PARTIAL PLAN - SHEET 2
657	E-352.00	CONTROL & INSTRUMENTATION - LOADING LEVEL PARTIAL PLAN - SHEET 1
658	E-353.00	CONTROL & INSTRUMENTATION - LOADING LEVEL PARTIAL PLAN - SHEET 2
659	E-354.00	CONTROL & INSTRUMENTATION - TIPPING LEVEL PARTIAL PLAN - SHEET 1
660	E-355.00	CONTROL & INSTRUMENTATION - TIPPING LEVEL PARTIAL PLAN - SHEET 2
661	E-356.00	CONTROL & INSTRUMENTATION - INTERMEDIATE LEVEL PARTIAL PLAN
662	E-357.00	CONTROL & INSTRUMENTATION - MECHANICAL PLATFORM LEVEL PARTIAL PLAN
663	E-401.00	LIGHTING - PIER LEVEL PARTIAL PLAN - SHEET 1
664	E-402.00	LIGHTING - PIER LEVEL PARTIAL PLAN - SHEET 2
665	E-403.00	LIGHTING - LOADING LEVEL PARTIAL PLAN - SHEET 1
666	E-404.00	LIGHTING - LOADING LEVEL PARTIAL PLAN - SHEET 2
667	E-405.00	LIGHTING - TIPPING LEVEL PARTIAL PLAN - SHEET 1
668	E-406.00	LIGHTING - TIPPING LEVEL PARTIAL PLAN - SHEET 2
669	E-407.00	LIGHTING - MECHANICAL PLATFORM LEVEL PARTIAL PLAN
670	E-408.00	LIGHTING FIXTURE SCHEDULE & DETAILS
671	E-409.00	PANEL SCHEDULES
672	E-410.00	EMERGENCY LIGHTING CONTROL WIRING DIAGRAM
673	E-411.00	LIGHTING CONTROL DIAGRAMS
674	E-412.00	EAST LONGITUDINAL SECTION - KALWALL AND CLERESTORY ACCENT LIGHTING
675	E-413.00	SECTION STAIR B LIGHTING
676	E-501.00	FIRE ALARM SYSTEM - PIER LEVEL PARTIAL PLAN - SHEET 1
677	E-502.00	FIRE ALARM SYSTEM - PIER LEVEL PARTIAL PLAN - SHEET 2
678	E-503.00	FIRE ALARM SYSTEM - LOADING LEVEL PARTIAL PLAN - SHEET 1
679	E-504.00	FIRE ALARM SYSTEM - LOADING LEVEL PARTIAL PLAN - SHEET 2
680	E-505.00	FIRE ALARM SYSTEM - TIPPING LEVEL PARTIAL PLAN - SHEET 1

Sheet No.	Drawing No.	Title
681	E-506.00	FIRE ALARM SYSTEM - TIPPING LEVEL PARTIAL PLAN - SHEET 2
682	E-507.00	FIRE ALARM SYSTEM - MECHANICAL PLATFORM LEVEL PARTIAL PLAN
683	E-508.00	FIRE ALARM SYSTEM RISER DIAGRAM
684	E-509.00	FIRE ALARM SYSTEM SEQUENCE OF OPERATIONS
685	E-601.00	VOICE/DATA AND PAGING SYSTEM - PIER LEVEL PARTIAL PLAN - SHEET 1
686	E-602.00	VOICE/DATA AND PAGING SYSTEM - PIER LEVEL PARTIAL PLAN - SHEET 2
687	E-603.00	VOICE/DATA AND PAGING SYSTEM - LOADING LEVEL PARTIAL PLAN - SHEET 1
688	E-604.00	VOICE/DATA AND PAGING SYSTEM - LOADING LEVEL PARTIAL PLAN - SHEET 2
689	E-605.00	VOICE/DATA AND PAGING SYSTEM - TIPPING LEVEL PARTIAL PLAN - SHEET 1
690	E-606.00	VOICE/DATA AND PAGING SYSTEM - TIPPING LEVEL PARTIAL PLAN - SHEET 2
691	E-607.00	VOICE/DATA AND PAGING SYSTEM - MEZZANINE PLAN
692	E-608.00	VOICE/DATA SYSTEM RISER DIAGRAM
693	E-609.00	PAGING SYSTEM RISER DIAGRAM
694	E-701.00	SECURITY & CCTV SYSTEM - PIER LEVEL PARTIAL PLAN SHEET 1
695	E-702.00	SECURITY & CCTV SYSTEM - PIER LEVEL PARTIAL PLAN SHEET 2
696	E-703.00	SECURITY & CCTV SYSTEM - LOADING LEVEL PARTIAL PLAN SHEET 1
697	E-704.00	SECURITY & CCTV SYSTEM - LOADING LEVEL PARTIAL PLAN SHEET 2
698	E-705.00	SECURITY & CCTV SYSTEM - TIPPING LEVEL PARTIAL PLAN SHEET 1
699	E-706.00	SECURITY & CCTV SYSTEM - TIPPING LEVEL PARTIAL PLAN SHEET 2
700	E-707.00	SECURITY & CCTV SYSTEM - MEZZANINE LEVEL
701	E-708.00	SECURITY & CCTV SYSTEM - LONGITUDINAL SECTION
702	E-709.00	SECURITY & CCTV SYSTEM - SITE SECURITY PLAN
703	E-710.00	SECURITY & CCTV SYSTEM - CCTV BLOCK DIAGRAM AND SECURITY NOTES
704	E-711.00	SECURITY & CCTV SYSTEM - SECURITY BLOCK DIAGRAMS AND DETAILS
705	E-712.00	SECURITY & CCTV SYSTEM -SECURITY POWER BLOCK DIAGRAM
706	E-713.00	SECURITY & CCTV SYSTEM -CCTV MOUNTING DETAILS
707	E-714.00	SECURITY & CCTV SYSTEM -CCTV SYSTEM RISER DIAGRAM
708	E-715.00	SECURITY & CCTV SYSTEM -ACCESS CONTROL SYSTEM RISER DIAGRAM

## **SCHEDULE D**

### **Electrical Motor Control Equipment**

Requirements for electrical motor equipment may be included in one or more sections of the Specifications for the Contract for the Project. Schedule D set forth below delineates specific information for electrical motor control equipment. In the event of any conflict between the specifications and this Schedule D, Schedule D shall take precedence; provided, however, in the event of an omission from Schedule D (i.e., Schedule D omits either a reference to or information concerning electrical motor equipment which is set forth in the Specifications), such omission from Schedule D shall have no effect and the Contractor's obligation with respect to the electrical motor control equipment, as set forth in the Specifications, shall remain in full force and effect.

Equip. Ident.	Equipment	Number of Units	H.P. or KW	Voltage & Phase
F-OHD-01	OVERHEAD DOOR	1	1.5	480 3
F-OHD-02	OVERHEAD DOOR	1	1.5	480 3
F-OHD-03	OVERHEAD DOOR	1	1.5	480 3
F-OHD-04	OVERHEAD DOOR	1	5.0	480 3
F-OHD-05	OVERHEAD DOOR	1	1.5	480 3
F-OHD-06	OVERHEAD DOOR	1	1.5	480 3
F-OHD-07	OVERHEAD DOOR	1	1.5	480 3
F-OHD-08	OVERHEAD DOOR	1	1.5	480 3
F-OHD-09	OVERHEAD DOOR	1	0.5	480 3
F-OHD-10	OVERHEAD DOOR	1	1.5	480 3
F-OHD-11	OVERHEAD DOOR	1	0.5	480 3
F-OHD-12	OVERHEAD DOOR	1	0.5	480 3
F-OHD-13	OVERHEAD DOOR	1	0.5	480 3
F-OHD-14	OVERHEAD DOOR	1	0.5	480 3
F-OHD-15	OVERHEAD DOOR	1	0.5	480 3
F-OHD-16	OVERHEAD DOOR	1	0.5	480 3
F-OHD-17	OVERHEAD DOOR	1	0.5	480 3
F-OHD-18	OVERHEAD DOOR	1	0.5	480 3
F-OHD-19	OVERHEAD DOOR	1	0.5	480 3
F-OHD-20	OVERHEAD DOOR	1	5.0	480 3
F-OHD-21	OVERHEAD DOOR	1	0.5	480 3
F-JKP-01	JOCKEY PUMP	1	2	460 3
F-AIC-01	DRY SPRINKLER SYSTEM AIR COMPRESSOR	2	2	460 3
F-DWP-01	WATER BOOSTER PUMP	3		480
F-DWP-1A	PUMP 1	1	1.5	---
F-DWP-1B	PUMP 2	1	1.5	---
F-DWP-1C	PUMP 3	1	0.75	---

Equip. Ident.	Equipment	Number of Units	H.P. or KW		Voltage & Phase	
F-HTS-02	HEAT TRACING SYSTEM	1			480	
F-HWH-04	WATER HEATER	1		15	480	3
F-HWH-05	WATER HEATER	1		15	480	3
F-HWH-06	WATER HEATER	1		15	480	3
F-LTX-01	LIGHTING TRANSFORMER	1	75	112 1/2	480	60
F-LTX-02	LIGHTING TRANSFORMER	1	75	112 1/2	480	60
F-LTX-03	LIGHTING TRANSFORMER	1		112 1/2	480	60
F-LTX-04	LIGHTING TRANSFORMER	1		112 1/2	480	60
F-LTX-05	LIGHTING TRANSFORMER	1		45	480	60
F-LTX-2A	LIGHTING TRANSFORMER	1		45	480	60
F-LTX-2B	LIGHTING TRANSFORMER	1		45	480	60
F-LTX-2C	LIGHTING TRANSFORMER	1		45	480	60
F-LTX-2D	LIGHTING TRANSFORMER	1		75	480	60
F-LTX-2E	LIGHTING TRANSFORMER	1		37.5	480	60
F-LTX-2F	LIGHTING TRANSFORMER	1		7.5	480	60
F-LPB-01	LIGHTING PANEL	1			480	60
F-LPB-02	LIGHTING PANEL	1			480	60
F-LPB-03	LIGHTING PANEL	1			480	60
F-LPB-04	LIGHTING PANEL	1			480Y /277	60
F-LPB-05	LIGHTING PANEL				480Y /277	60
F-LPB-2A	LIGHTING PANEL	1			208Y /120	60
F-LPB-2B	LIGHTING PANEL	1			208Y /120	60
F-LPB-2C	LIGHTING PANEL	1			208Y /120	60
F-LPB-2D	LIGHTING PANEL	1			208Y /120	60
F-LPB-2E	LIGHTING PANEL	1			240/ 120	60
F-LPB-2F	LIGHTING PANEL	1			240/ 120	60
F-GEN-01	GENERATOR	1		750	480	60
F-XMR-04	TRANSFORMER	1		30	480	60
F-XMR-05	TRANSFORMER	1		45	480	60
F-XMR-06	TRANSFORMER	1		30	480	60
F-MLC-01	MINI POWER/LOAD CENTER	1	5		480	60
F-CPR-01	CATHODIC PROTECTION	1		*	480	60



Equip. Ident.	Equipment	Number of Units	H.P. or KW		Voltage & Phase	
	RECTIFIER					
F-CPR-02	CATHODIC PROTECTION RECTIFIER	1		*	480	60
F-UPB-01	UPS PANELBOARD	1		30	208Y/120	60
F-FACP-01	FIRE ALARM CONTROL PANEL				120	60
F-PSP-01	PURGE PANEL	1			120	60
F-CAP-01	CAPSTAN HOIST	1	15		480	3
F-CAP-02	CAPSTAN HOIST	1	15		480	3
F-CAP-03	CAPSTAN HOIST	1	15		480	3
F-CTW-01	CONSTANT TENSION WINCH	1	40		480	3
F-CTW-02	CONSTANT TENSION WINCH	1	40		480	3
F-SWS-01	SERVICE WATER SYSTEM	3			480	
F-SWS-1A	PUMP 1A	1	7.5		---	3
F-SWS-1B	PUMP 1B	1	7.5		---	3
F-SWS-1C	PUMP 1C	1	7.5		---	3
F-OCS-01	ODOR CONTROL SYSTEM	2			480	
F-OCS-1A	PUMP 1A	1	5		---	3
F-OCS-1B	PUMP 1B	1	5		---	3
F-DSS-01	DUST SUPPRESSION SYSTEM	1			480	
F-DSS-1A	PUMP 1A	1	7.5		---	3
F-DSS-1B	PUMP 1B	1	7.5		---	3
F-PAC-01	PURGE AIR COMPRESSOR	1	5		230/480	
F-OBC-01	5 TON BRIDGE CRANE	1	8.5		480	
F-PPW-01	PORTABLE PRESSURE WASHER	1	1 1/2		480	3
F-LSE-01	LIDDING SPREADER	1	20		480	3
F-LSE-02	LIDDING SPREADER	1	20		480	3
F-LSE-03	LIDDING SPREADER	1	20		480	3
F-LSE-04	LIDDING SPREADER	1	20		480	3
F-SBC-01	SHUTTLE BATTERY CHARGERS	1		14.4	480	3
F-SBC-02	SHUTTLE BATTERY CHARGERS	1		14.4	480	3
F-SBC-03	SHUTTLE BATTERY CHARGERS	1		14.4	480	3
F-SBC-04	SHUTTLE BATTERY	1		14.4	480	3

Equip. Ident.	Equipment	Number of Units	H.P. or KW		Voltage & Phase	
	CHARGERS					
F-SBC-05	SHUTTLE BATTERY CHARGERS	1		14.4	480	3
F-HSG-01	HYDRAULIC SWING GATE	1			480	
F-HSG-02	HYDRAULIC SWING GATE	1			480	
F-HTS-01	HEAT TRACING SYSTEM	1		30 KVA	480	
F-PLC-01	INTERFACE PANEL	1		0.3	120	
F-PLC-02	INTERFACE PANEL	1		0.3	120	
F-HTS-03	HEAT TRACING SYSTEM	1		30KVA	480	
F-VES-01	VEHICLE EXHAUST FAN	1	5		460	3
F-MPC-01	MODULATING PRESSURE CONTROL PANEL					
F-SAF-01	SUPPLY AIR FAN	1	30		460	3
F-SAF-02	SUPPLY AIR FAN	1	25		460	3
F-SAF-03	SUPPLY AIR FAN	1	30		460	3
F-SAF-04	SUPPLY AIR FAN	1	25		460	3
F-SAF-05	SUPPLY AIR FAN	1	30		460	3
F-SAF-06	SUPPLY AIR FAN	1	25		460	3
F-SAF-07	SUPPLY AIR FAN	1	25		460	3
F-SAF-08	SUPPLY AIR FAN	1	40		460	3
F-SAF-09	SUPPLY AIR FAN	1	0.75		460	3
F-SAF-10	SUPPLY AIR FAN	1	5		460	3
F-EAF-01	EXHAUST AIR FAN	1	20		460	3
F-EAF-02	EXHAUST AIR FAN	1	20		460	3
F-EAF-03	EXHAUST AIR FAN	1	15		460	3
F-EAF-04	EXHAUST AIR FAN	1	20		460	3
F-EAF-05	EXHAUST AIR FAN	1	15		460	3
F-EAF-06	EXHAUST AIR FAN	1	20		460	3
F-EAF-07	EXHAUST AIR FAN	1	25		460	3
F-EAF-08	EXHAUST AIR FAN	1	40		460	3
F-EAF-09	EXHAUST AIR FAN	1	1		460	3
F-EAF-10	EXHAUST AIR FAN	1	5		460	3
F-EAF-13	EXHAUST AIR FAN	1	3		460	3
F-EAF-14	EXHAUST AIR FAN	1	10		460	3
F-EAF-16	EXHAUST AIR FAN	1	2		460	3
F-RAF-01	RETURN AIR FAN	1	1.50		460	3
F-RAF-02	RETURN AIR FAN	1	0.75		460	3
F-RAF-04	RETURN AIR FAN	1	1.50		460	3
F-RAF-05	RETURN AIR FAN	1	1.50		460	3
F-RAF-06	RETURN AIR FAN	1	5		460	3

Equip. Ident.	Equipment	Number of Units	H.P. or KW		Voltage & Phase	
F-ACU-01	AIR CONDITIONING UNIT	1	7.50		460	3
F-ACU-02	AIR CONDITIONING UNIT	1	3		460	3
F-ACU-03	AIR CONDITIONING UNIT	1	2		460	3
F-ACU-05	AIR CONDITIONING UNIT	1	2	25	460	3
F-HVU-01	HEATING AND VENTILATING UNIT	1	7.5		460	3
F-HVU-02	HEATING AND VENTILATING UNIT	1	7.5		460	3
F-RHC-02	REHEAT COIL	1		2	480	3
F-RHC-03	REHEAT COIL	1		1	480	3
F-RHC-04	REHEAT COIL	1		7	480	3
F-RHC-05	REHEAT COIL	1		7.5	480	3
F-RHC-06	REHEAT COIL	1		1.2	480	3
F-RTU-02	ROOFTOP UNIT	1	5.33	18	480	3
F-ACC-01	AIR COOLED CONDENSING UNIT	1	1	28.3	480	3
F-ACC-02	AIR COOLED CONDENSING UNIT	1	0.50	5.59	480	3
F-ACC-03	AIR COOLED CONDENSING UNIT	1	0.25	6.56	480	3
F-ACC-05	AIR COOLED CONDENSING UNIT	1	0.17	6.73	480	3
F-EUH-01	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-02	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-03	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-04	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-05	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-06	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-EUH-07	ELECTRIC UNIT HEATER	1	0.02	7.50	480/ 115	3/1. 0
F-GMP-01	PANEL	1		0.2-10P	120	

**SCHEDULE E**

**Separation of Trades**

**(Reference: Article 1.40 of the General Conditions)**

NOT USED

## SCHEDULE F

### Shop Drawing and Material Samples Schedule

(Reference: Article 1.41 of the General Conditions)

The Schedule set forth below lists all submittal requirements for the Contract. In the event of any conflict between the Specifications and this Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.

CONSULTANT: Greeley and Hansen

DATE: \_\_\_\_\_

TELEPHONE NUMBER:

DDC PROJECT MANAGER: John Ziedonis

APPROVED: \_\_\_\_\_

TELEPHONE NUMBER: 718.391.2864

(DDC RESIDENT ENGINEER/CPM)

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:				TRADE: SHOP DRAWING LOG SHEET #		USE SEPARATE SHEET FOR EACH TRADE									
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL		SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS									
			SHOP DWG.	SAMPLE	CAT. CUTS			REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	
01332	Record Drawings		X														
01355	Regulated Materials Control		X														
01435	Monitoring Survey		X		X												
01733	Construction Waste Management		X														
01750	Spare Parts and Maintenance Materials		X														
01811	Preliminary and Final Field Tests		X														
02081	Fire Hydrants, Post Hydrants and Appurtenances		X		X												































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**CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION**

**SOUTHWEST BROOKLYN MARINE TRANSFER STATION**

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**Section 01120**  
**CONTRACT SUMMARY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Location of work
- B. Description of Work
- C. Site Characterization Reports and Information

**1.02 LOCATION OF WORK**

- A. The work of this contract will be performed at Southwest Brooklyn, Borough of Brooklyn, on Gravesend Bay, south of 25th Avenue (Paper Street) and west of Shore Parkway.

**1.03 DESCRIPTION OF WORK**

- A. The following is a general description only, and shall not be construed as a complete description of the work to be performed.
- B. The principal items of work are:
  - 1. Demolition of existing fendering system, site structures and equipment.
  - 2. Dredging in area of new transfer station.
  - 3. Construction of new underground utility system and utility system foundation.
  - 4. Construction of new marine transfer station.
  - 5. Construction and installation of new container gantry crane.
  - 6. Construction and installation of new container transport system.
  - 7. Construction of new roadways and parking areas.
  - 8. Construction of new bulkhead walls and property line fence.
  - 9. Final grading and landscaping of land surrounding the new construction.
  - 10. Furnishing, installing, testing, and placing into operation complete HVAC systems, including new air distribution equipment, heat transfer equipment, ductwork, air monitoring systems, controls, and system testing and balancing.

11. Furnishing, installing, testing and placing into operation complete plumbing systems, including hot and cold water systems, storm drainage and sanitary drainage systems, fixtures and trim, and a new natural gas service from the utility company.
12. Furnishing, installing, testing and placing into operation fire protection pumping systems.
13. Furnishing, installing, testing and placing into operation complete electrical systems including a new substation, power distribution system, lighting and receptacle system.
14. Furnishing, installing, testing and placing into operation the following complete ancillary systems:
  - a. Fire detection, alarm and warning system
  - b. Lightning protection system
  - c. Security system
  - d. Telephone and paging system
  - e. Communication - intercom system
  - f. Closed-circuit television system

#### 1.04 SITE CONDITIONS AND SUBSURFACE CHARACTERIZATION REPORTS

- A. For the purposes of design, borings have been made, samples taken, and environmental investigations and topographical surveys have been made at the proposed Sites. The following documents are available for inspection by bidders.
  1. *Draft Initial Soil and Groundwater Sampling Program Summary Report*, April 2004.
  2. *Southwest Brooklyn Marine Transfer Station Design Repair Inspection, Appendix I, Supplemental Report of Findings*, December 12, 2003.
  3. *Southwest Brooklyn Marine Transfer Station Special Underwater Inspections, Report of Findings*, July 10, 2003.
  4. *Draft Preliminary Geotechnical Investigation Report, Southwest Brooklyn DSNY Marine Transfer Station, Brooklyn, NY*, October 24, 2003.
  5. *Survey of Mooring Equipment at Marine Transfer Stations*, May 11, 1994.
  6. *Stormwater Pollution Prevention Plan (SWPPP) Covering Construction at the Southwest Brooklyn Marine Transfer Station*
- B. Application for inspection of geotechnical data and other reports should be made to DSNY Bureau of Long Term Export, 7th Floor, 44 Beaver Street, NY, NY 10004. All such material and information relating to boring records and subsurface

conditions are expressly excluded from and are not a part of this Contract and are available for information purposes only. The DSNY does not warrant the accuracy of these documents.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01140**  
**WORK RESTRICTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Working hours

**1.02 RELATED SPECIFICATIONS**

- A. Section 01271 – Milestones, Incentives, and Liquidated Damages
- B. Section 01321 – Progress Schedule

**1.03 WORKING HOURS**

- A. The normal working hours for the project will be an 8-hour work day between the hours of 7:00 AM and 6:00 PM as directed by the Commissioner, Monday through Friday. However, due to the Construction Schedule, the Contractor is advised that he has the option to work a second shift and/or additional scheduled overtime, as needed, to complete all intermediate activities and to meet the date of substantial completion of the work as defined by Article 14 of the Standard Construction Contract and not later than the scheduled dates as defined in Sections 01271 – Milestones, Incentives, and Liquidated Damages, and 01321 - Progress Schedule, and the General Conditions.
- B. The Contractor shall have sufficient forms, shoring and other construction material; labor; permanent materials; equipment; tools and supervision available to support a second shift and/or scheduled overtime.
- C. The Contractor shall review the schedules to ensure his ability to comply therewith. The Contractor shall not be entitled to any extra compensation beyond the Contract price in order to meet the scheduled dates.
- D. The Contractor will be directed to take remedial actions as necessary to recover lost time as determined from the Construction CPM Schedules and in accordance with Section 01321 – Progress Schedule. The Contractor shall make no claim for extra compensation solely because of additional costs to meet the schedules dates or to recover slippage due to Contractor-caused delays.
- E. The Contractor must receive the Commissioner's approval in writing to perform work outside of normal working hours. Except in case of emergency involving danger to persons or property, when work is scheduled to be performed beyond the normal hours, a second shift, at night or during weekends, the Contractor shall request approval for such work at least 5 days in advance of the beginning of such work. It is each Contractor's responsibility to adhere to any local laws or ordinances that may govern or restrict the performance of such work.



PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01270**  
**MEASUREMENT AND PAYMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Description of all Bid Items to be included in the total bid. Payments shall be made as described in the following paragraphs of this Specification.

**1.02 LUMP SUM BID ITEMS**

- A. Lump Sum Bid Item 1 will constitute full compensation for all work and costs to complete the Project, with the exception of other lump sum bid items, unit price bid items and allowances. Any work not specifically included in allowances or unit price contract items will be deemed included in lump sum Bid Item 1.
- B. Lump Sum Bid Item 2: Ramp Construction. Under Bid Item 2 the Contractor shall perform all work to construct the new ramp from the property line to the new marine transfer station. The Contractor has the choice of two options for completion of this Bid Item. Option 1 includes completion of the ramp as shown on Drawings R-001 through R-102. The second option includes completion of the ramp as shown on Drawings R-201 through R-302. Each option includes pile caps, support piers, scale pit, bearings, superstructure, traffic barriers, screen walls, catch basins, pavement markings and all other appurtenances required for a complete installation.
- C. Lump Sum Bid Item 3: Site Work and Landscaping. Under Bid Item 3 the Contractor shall perform all site work, grading, landscaping and site utility work required for completion of the Contract, including utilities on the ramp and site utility demolition. This work is shown primarily on the Civil/Site Work Contract Drawings.
- D. Lump Sum Bid Item 4: Container Gantry Cranes. Under Bid Item 4 the Contractor shall furnish, install, test and place into operation container gantry cranes, including power rails as described in accordance with Section 14640 – Container Gantry Crane.
- E. Lump Sum Bid Item 5: 3-Year Service Agreement for Container Gantry Cranes. Under Bid Item 5 the Contractor shall furnish a 3-year service agreement for the container gantry cranes as described in Section 14640 – Container Gantry Crane.
- F. Lump Sum Bid Item 6: Heating, Ventilation and Air Conditioning. Under Bid Item 6 the Contractor shall perform all heating, ventilation and air conditioning work for the new marine transfer station. The principal items of work include furnishing, installing, testing, and placing into operation complete HVAC systems, including new air distribution equipment, heat transfer equipment, ductwork, air

monitoring systems, controls, and system testing and balancing. This work is shown primarily on the HVAC Contract Drawings.

- G. Lump Sum Bid Item 7: Plumbing. Under Bid Item 7 the Contractor shall perform all plumbing work for the new marine transfer station. The principal items of work are shown on the Plumbing Contract Drawings and include:

1. Furnishing, installing, testing and placing into operation complete plumbing systems, including hot and cold water systems, storm drainage and sanitary drainage systems, fixtures and trim, and a new natural gas service from the utility company.
2. Furnishing, installing, testing and placing into operation fire protection pumping systems.

- H. Lump Sum Bid Item 8: Electrical Work. Under Bid Item 8 the Contractor shall perform all electrical work for the new marine transfer station. The principal items of work are shown on the Electrical Contract Drawings and include:

1. Demolition: De-energizing equipment prior to demolition and removal
2. Furnishing, installing, testing and placing into operation complete electrical systems including a new substation, power distribution system, lighting and receptacle system.
3. Furnishing, installing, testing and placing into operation the following complete ancillary systems:
  - a. Fire detection, alarm and warning system
  - b. Lightning protection system
  - c. Security system
  - d. Telephone and paging system
  - e. Communication - intercom system
  - f. Closed-circuit television system

- I. Not Used.

- J. Not Used.

#### 1.03 ALLOWANCES

- A. The following allowances shall be included in the total bid for the Contract. Descriptions of each allowance are included in the sections referenced. Any unexpended balances of allowances will be retained by the City of New York. If the Contractor anticipates an allowance will be exceeded, he must request a Change Order for the amount of the exceedance.

1. Bid Item 11: Hazardous material remediation work, in the amount shown on the Bid Form, as described in Section 01355 – Regulated Materials Control.
2. Bid Item 12: Con Edison Electrical Service Work, in the amount shown on the Bid Form. This allowance will be used to pay fees associated with work performed by Con Edison to bring electrical service to the site. When directed by the Commissioner, the Contractor shall pay the amount indicated to Con Edison within 48 hours of notification. The Contractor will be reimbursed from the allowance for the amount paid, with no provision for overhead and profit.

#### 1.04 UNIT PRICE BID ITEMS

1. Bid Item 13: Dredging
  - a. Under Bid Item 13, the Contractor shall perform all dredging as shown on the Contract Drawings and specified, in accordance with Section 02325 – Dredging and Dredged Material Disposal.
  - b. Payment for dredging will be made at the unit price bid per cubic yard for Bid Item 13.
2. Bid Items 14, 15 and 16: Steel Pipe Piles
  - a. Under Bid Items 14 through 16, the Contractor shall furnish and install concrete-filled steel pipe piles in accordance with Section 02364 - Steel Pipe Piles.
  - b. Payment for concrete-filled steel pipe piles will be made at the unit price bid per linear foot for the following Bid Items:

<u>Bid Item</u>	<u>Description</u>
14	16-inch diameter Steel Pipe Piles
15	20-inch diameter Steel Pipe Piles OR 150-Ton Composite Tapered Piles
16	36-inch diameter Steel Pipe Piles

- c. For Bid Item 15, the Contractor has the option to bid either 20-inch diameter steel pipe piles as described above or 150-ton composite tapered piles in accordance with Section 02365 – Composite Tapered Piles. If the Contractor chooses to bid a price for 150-ton composite tapered piles in lieu of 20-in diameter steel pipe piles, payment for composite tapered piles will be made at the unit price bid per pile.
- d. For Bid Item 16 the quantity and total length of piles will depend on which option the Contractor chooses for construction of the ramp, as described in Bid Item 2 and as shown on the Bid Form.

## 3. Bid Item 17: Pile Driving Analyzer Load Tests

- a. Under Bid Item 17, the Contractor shall perform pile driving analyzer load testing in accordance with Section 02364 - Steel Pipe Piles.
- b. Payment for pile driving analyzer load tests will be made at the unit price bid per test for Bid Item 17.

## 4. Bid Items 18, 19, 20, and 21: Pile Load Tests

- a. Under Bid Items 18 through 21, the Contractor shall perform pile load testing in accordance with Section 02456 - Pile Load Tests.
- b. Payment for pile load testing will be made at the unit price bid per test for the following Bid Items:

<u>Bid Item</u>	<u>Description</u>
18	Compression Pile Load Tests - Steel Pipe Piles, 20-inch diameter
19	Compression Pile Load Tests - Steel Pipe Piles, 36-inch diameter
20	Lateral Pile Load Tests - Steel Pipe Piles, 20-inch diameter OR Composite Tapered Piles
21	Lateral Pile Load Tests - Steel Pipe Piles, 36-inch diameter

## 5. Bid Item 22: Marine Timber Piles

- a. Under Bid Item 22, the Contractor shall furnish and install marine timber piles in accordance with Section 02464 - Marine Timber Piles.
- b. Payment for marine timber piles will be made at the unit price bid per linear foot for Bid Item 22.

## 6. Bid Items 23, 24, 25, 26, and 27: Concrete Repair

- a. Under Bid Items 23 through 27, the Contractor shall perform concrete repair in accordance with Section 03930 - Concrete Restoration.
- b. Payment for concrete repair will be made at the unit price bid for the following Bid Items:

<u>Bid Item</u>	<u>Description</u>
23	Shallow Concrete Repair
24	Deep Concrete Repair

<u>Bid Item</u>	<u>Description</u>
25	Concrete Crack Repair – Type A
26	Concrete Crack Repair – Type B
27	Concrete Crack Repair – Type C

7. Bid Item 28: Additional Excavation

a. Description

- (1) Under Bid Item 28, the Contractor shall perform all additional excavation which may be ordered in writing by the Commissioner.
- (2) The work shall be in accordance with Section 02316 - Excavation.
- (3) The work includes all clearing, temporary sheeting, bracing and shoring, removal of water, transportation and disposal of surplus excavated material, and other work appurtenant to the additional excavation as ordered.

b. Measurement for Payment

- (1) The quantity of additional excavation, in cubic yards, to be measured for payment under this Bid Item shall be the total earth excavated as ordered and approved by the Commissioner beyond and outside the lines and grades necessary to perform the work under Bid Items 1, 2, and 3, measured in place before excavation.
- (2) Unauthorized additional excavation will not be measured or paid for.
- (3) Excavation made to permit placement of select fill materials or concrete cradle or encasement ordered in writing by the Commissioner and not shown on the Contract Drawings will be measured for payment under this Contract Item.

c. Payment for additional excavation, ordered in writing, will be made at the Contract unit price bid per cubic yard for Bid Item 28.

8. Bid Item 29: Additional Select Fill Material

a. Description

- (1) Under Bid Item 29, the Contractor shall furnish, transport and place additional select fill material where ordered in writing by the Commissioner.
- (2) The work shall be in accordance with Section 02317 - Backfilling.

- b. Measurement for Payment: The quantity of additional select fill material, in cubic yards, to be measured for payment under this Bid Item will be the actual volume of material placed, measured in place within the appropriate limiting lines established by the Commissioner. Select fill materials used to fill voids resulting from unauthorized excavation will not be measured or paid for, even though their use is ordered by the Commissioner.
  - c. Payment for additional select fill material, ordered in writing, will be made at the Contract unit price bid per cubic yard for Bid Item 29.
9. Bid Item 30: Additional Common Fill Material
- a. Description
    - (1) Under Bid Item 30, the Contractor shall furnish, transport and place additional common fill material where ordered in writing by the Commissioner.
    - (2) The work shall be in accordance with Section 02317 - Backfilling.
  - b. Measurement for Payment: The quantity of additional common fill material, in cubic yards, to be measured for payment under this Bid Item will be the actual volume of material placed, measured in place within the appropriate limiting lines established by the Commissioner. Common fill materials used to fill voids resulting from unauthorized excavation will not be measured or paid for, even though their use is ordered by the Commissioner.
  - c. Payment for additional common fill material, ordered in writing, will be made at the Contract unit price bid per cubic yard for Bid Item 30.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01271**  
**MILESTONES AND LIQUIDATED DAMAGES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section addresses Milestone Items, assessments of liquidated damages, and scheduling constraints for timely completion of the work.

**1.02 GENERAL**

- A. This Project is critical and TIME IS OF THE ESSENCE. The timely completion of this project is essential to the implementation of the City's Solid Waste Management Plan (SWMP). Therefore, the City will assess liquidated damages in the event that the Contractor fails to achieve certain Milestones during the course of the Project and liquidated damages in the event that the Contractor fails to meet the contractual completion schedule for the Project.

**1.03 MILESTONE ITEMS**

- A. In order to ensure timely completion, Milestone Items for which liquidated damages and incentives for early completion will be applicable are as follows.
  - 1. MILESTONE 1 - Complete construction of the pier level platform: Completion of this Milestone includes, but is not limited to, completion of the new MTS foundations and completion of the pier level platform, construction and enclosure of the new Marine Transfer Station superstructure including exterior walls, elevated slabs and walkways, stair towers, masonry and roof, enclosed, watertight and completed in accordance with Article 1.15.B of the General Conditions - Enclosure of Structures.
  - 2. MILESTONE 2 -The Contract Time for Completion as described in the Standard Construction Contract and Schedule "A." Milestone 2 includes Substantial Completion of all Contract Work necessary in order to allow DSNY to occupy the building and operate without any restrictions whatsoever, including but not limited to, administrative, maintenance and repair areas and operability of all building operating systems and HVAC systems.



- B. Time for Completion of each Milestone Item is shown below.

Milestone	Time for Completion (CCD)
1	730
2	1095

#### 1.04 LIQUIDATED DAMAGES

- A. Liquidated damages for failure to achieve timely completion of the Work (Milestone 2) will be assessed as described in Article 15 of the Standard Construction Contract and in Schedule "A". The liquidated damages described in this Section for Milestone Items are assessed for failure to complete all the Contract Work within the time prescribed in Schedule "A."
- B. Should Milestone Completion within Milestones 1 or 2 occur after the scheduled Time for Completion set for that Milestone, plus authorized time extensions pursuant to Article 13 of the Standard Construction Contract, or if the Contractor, in the sole determination of the Commissioner, should abandon the work, the City will assess liquidated damages against the Contractor in an amount determined as follows: the liquidated damage amount for that Milestone as stated in Paragraph (4) of this Subsection, below, multiplied by the number of calendar days in which Milestone Completion of that Milestone of the work occurs after the scheduled Time for Completion set for that Milestone, plus authorized extensions; which said sum, in view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of delay in the completion of the work hereunder, is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such delay, and not as a penalty. This article shall also apply to the Contractor if it is defaulted pursuant to Chapter X of this Standard Construction Contract. Neither the failure to assess liquidated damages nor the granting of any time extension shall operate as a waiver or release of any claim the City may have against the Contractor for either actual or liquidated damages.
- C. Calculation: For the purposes of calculating the number of calendar days for liquidated damage assessment, such calculation shall not include the day of scheduled Milestone completion.
- D. Liquidated damages for milestones will be assessed against the Contractor as set forth herein should the Contractor fail to complete the Milestone within the scheduled Time for Completion of that Milestone plus any authorized time extensions. Liquidated damages will be assessed against the Contractor for those days or portion thereof as to which the Contractor is deemed responsible for the Milestone Item not being completed within the Time for Completion listed in Paragraph 1.03 above.

- E. The amount of liquidated damages will be determined as follows: the liquidated damages value stated in Paragraph 1.06 multiplied by the number of calendar days (or portion thereof) that the date of completion of the Milestone Item occurs after the scheduled Time for Completion.
- F. In the event liquidated damages are assessed, the City will deduct and retain out of the monies which may become due under this Contract, the amount of any liquidated damages assessment. If such amount due under the Contract shall be less than the liquidated damages assessment, the Contractor shall be liable to pay the difference upon demand by the City. Liquidated damages for failure to complete a Milestone Item within the scheduled time for completion shall be assessed even should the Contractor abandon the work.

1.05 DETERMINATION OF MILESTONE COMPLETION

- A. A Milestone within the Contract shall have achieved "Milestone Completion" when, in the sole determination of the Commissioner, all construction work associated with the specific Milestone as defined in Paragraph 1.03 above, together with any and all change order work, have been completely installed, tested, made operational, and accepted by the City. The determination of Milestone Completion will be made solely by the Commissioner, and his decision with respect thereto shall be accepted as final, binding and conclusive.
- B. For the purpose of determining the Time for Completion, the construction start date will be the date indicated on the Notice to Proceed.

1.06 LIQUIDATED DAMAGE VALUES

- A. Liquidated Damage values for each Milestone Item are as follows:
  - 1. Milestone 1: \$5,000/day
  - 2. Milestone 2: \$5,000/day
- B. The Commissioner, in the exercise of his sole and absolute discretion, may reduce assessments of liquidated damages for Milestones not achieved by the Contractor if later Milestone dates are achieved.
- C. There will be no limit to the amount of liquidated damages which may be assessed for the failure to achieve each Milestone.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01310**  
**PROJECT COORDINATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor cooperation
- B. Daily work plans
- C. Project meetings
- D. Coordination drawings

**1.02 RELATED SPECIFICATIONS**

- A. Section 01321 - Construction Progress Scheduling

**1.03 CONTRACTOR COOPERATION**

- A. The Contractor shall allow the City of New York, the Commissioner and their agents, to enter upon the work for the purpose of constructing, operating, maintaining, removing, repairing, altering or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the work. The Contractor shall cooperate with all the aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by the City of New York, or others, to be done in connection with its work, or in connection with normal use of the facilities.
- B. The Contractor shall cooperate fully with the City of New York, the Commissioner, and any other contractors employed on the work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. Insofar as possible, decisions of all kinds required from the Commissioner shall be anticipated by the Contractor to provide ample time for inspection, or the preparation of instructions.

**1.04 DAILY WORK PLANS**

- A. The Contractor shall submit a Daily Work Plan to the Resident Engineer by 2:00 p.m. of the previous workday, stating the types and locations of the work to be performed the following day. The Daily Work Plan may be handwritten and faxed to his attention.

## 1.05 PROJECT MEETINGS

- A. General: Meetings will be held at the site as scheduled by the Resident Engineer, at which time the Contractor shall have representatives present to discuss all details relative to the execution of the work.
1. The Contractor shall provide ample office space, tables and chairs to accommodate all present at the meetings, and table space for Drawings.
  2. The Resident Engineer will preside over these meetings and will record the minutes thereof. Prior to each meeting the Resident Engineer will consult with the Contractor and prepare an agenda of items to be discussed. In general, after informal discussion of any item on the agenda, the Resident Engineer will summarize the discussion in a brief written statement and the Contractor shall then dictate a brief statement for the record. The Resident Engineer will distribute copies of the meeting minutes to all parties within 3 days of the meeting.
  3. Project meetings shall conform to the requirements of the General Conditions.
- B. Preconstruction conferences will be held prior to beginning certain items of work, as specified. Attendance and will be mandatory unless otherwise specified.
1. Attendees: Authorized representatives of the City of New York, the Commissioner; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule
    - b. Phasing
    - c. Critical work sequencing and long-lead items
    - d. Designation of key personnel and their duties
    - e. Procedures for processing field decisions and Change Orders
    - f. Procedures for requests for interpretations (RFIs)
    - g. Procedures for testing and inspecting
    - h. Procedures for processing Applications for Payment
    - i. Distribution of the Contract Documents
    - j. Submittal procedures
    - k. Preparation of Record Documents
    - l. Use of the premises
    - m. Work restrictions
    - n. Responsibility for temporary facilities and controls
    - o. Construction waste management and recycling
    - p. Parking availability

- q. Office, work, and storage areas
  - r. Equipment deliveries and priorities
  - s. First aid
  - t. Security
  - u. Progress cleaning
  - v. Working hours
  - w. Procedures for required subcontractor approval requests
- C. Preinstallation conferences will be held at Project site before each construction activity that requires coordination with other construction. Preinstallation conferences will be held when required by the technical specifications and as directed by the Resident Engineer.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Resident Engineer of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents
    - b. Options
    - c. Related requests for interpretations (RFIs)
    - d. Related Change Orders
    - e. Purchases
    - f. Deliveries
    - g. Submittals
    - h. Review of mockups
    - i. Possible conflicts
    - j. Compatibility problems
    - k. Time schedules
    - l. Weather limitations
    - m. Manufacturer's written recommendations
    - n. Warranty requirements
    - o. Compatibility of materials
    - p. Acceptability of substrates
    - q. Temporary facilities and controls
    - r. Space and access limitations
    - s. Regulations of authorities having jurisdiction
    - t. Testing and inspecting requirements
    - u. Installation procedures
    - v. Coordination with other work
    - w. Required performance results
    - x. Protection of adjacent work
    - y. Protection of construction and personnel
    - z. Status of pending and anticipated future subcontractor approval requests

3. Resident Engineer will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress meetings will be conducted at intervals as directed by the Resident Engineer. The progress meetings specified herein are in addition to the monthly progress meetings specified in Section 01321 – Construction Progress Scheduling.
1. Attendees: In addition to the City of New York and the Resident Engineer, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - (1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - (1) Interface requirements
      - (2) Sequence of operations
      - (3) Status of submittals
      - (4) Deliveries
      - (5) Off-site fabrication
      - (6) Access
      - (7) Site utilization
      - (8) Temporary facilities and controls
      - (9) Work hours
      - (10) Hazards and risks
      - (11) Progress cleaning
      - (12) Quality and work standards

- (13) Status of correction of deficient items
  - (14) Field observations
  - (15) Requests for interpretations (RFIs)
  - (16) Status of proposal requests
  - (17) Pending changes
  - (18) Status of Change Orders
  - (19) Pending claims and disputes
  - (20) Documentation of information for payment requests
  - (21) Subcontractor approval requests
3. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Daily coordination meetings will be held as directed by the Resident Engineer. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.
- 1. Attendees: In addition to the City of New York and the Resident Engineer, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to the Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise the Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report for each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - (1) Interface requirements
      - (2) Sequence of operations



- (3) Status of submittals
- (4) Deliveries
- (5) Off-site fabrication
- (6) Access
- (7) Site utilization
- (8) Temporary facilities and controls
- (9) Work hours
- (10) Hazards and risks
- (11) Progress cleaning
- (12) Quality and work standards
- (13) Change Orders
- (14) Subcontractor approvals

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01321**  
**CONSTRUCTION PROGRESS SCHEDULING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General requirements for Critical Path Method (CPM) Schedule.
- B. Progress meeting and reports.
- C. Remedial measures.

**1.02 PAYMENT**

- A. The Contractor shall include the cost for furnishing the Construction Scheduling services as described herein in the lump sum price bid for Bid Item 1.
- B. The first Partial Payment will be based on the actual amount of Work completed in accordance with the approved payment breakdown. However, the second Partial Payment will not be made until the CPM Schedule has been finalized and the activity costs have been approved by the City of New York.
- C. The sum of all the activity costs must total the Contract price.

**1.03 DEFINITIONS**

- A. A work activity is defined as an activity which requires time and resources, (manpower, equipment, and/or material) to complete and must be performed before the Contract is considered complete.
- B. For the purpose of determining the Time for Completion, the construction start date will be the date indicated on the Notice to Proceed.
- C. Float or slack is defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the City of New York or the Contractor.

**1.04 GENERAL REQUIREMENTS**

- A. The Construction Manager will provide a CPM Consultant to assist the Contractor in the preparation of a detailed working plan and schedule, and in subsequent schedule updates.
- B. The CPM Consultant will furnish a copy of the updated network analysis and monthly summary to the Contractor.

- C. The Critical Path Method (CPM) shall be used to control the progress of the job. This system will be implemented by the CPM Consultant provided by the Commissioner.
1. The Contractor shall cooperate fully with the CPM Consultant in the preparation and maintenance of the schedule. All costs incurred by the Contractor to correctly develop and implement the CPM Schedule shall be borne by the Contractor as part of the Contract. The Contractor shall be responsible for its own subcontractors and suppliers in implementing the CPM Schedule.
  2. The Contractor is deemed to have included in the bid prices sufficient monies to pay all expenses in connection with supplying the system with sufficient information to guarantee its successful operation and implementation.
- D. After the execution of the Construction Contract, the CPM Consultant will work with the Contractor to develop a comprehensive network diagram covering all portions of the Work and trades. The Contractor is obliged to supply information including work activity descriptions, sequence of Work, time estimates and dollar values for each activity to be included in the preparation of the network, all as requested by the CPM Consultant.
1. Within one week after the execution of the Construction Contract, the Contractor shall submit the name, address and telephone number of the person designated by the Contractor as its lawful CPM Representative and schedule contact.
- E. Both the early and late finish dates for construction completion on the approved CPM Schedule shall be equal to the total Contract duration. The detailed CPM network for the entire Project shall be submitted to the Commissioner as soon as possible following the Notice to Proceed. The CPM network will be reviewed by the Commissioner.
- F. The Commissioner will be the final judge as to the proper functioning of the CPM network and is empowered under the terms of the Contract to call upon the Contractor to remedy the functioning of the systems whenever deficiencies of whatever nature occur during the course of the Work. Refusal by the Contractor to maintain the progress of the Work consistent with the CPM schedule shall be interpreted as a delay of Contract.
1. Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will not be allowed except on a case-by-case basis with the approval of the Commissioner. A written explanation of each shall be included in the monthly submittal. The Commissioner may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

## PART 2 PRODUCTS

## 2.01 PROJECT PLAN AND CPM SCHEDULE

- A. Within seven working days after the Notice to Proceed of this Contract the CPM Consultant shall meet with the Contractor to develop a comprehensive and detailed working plan and schedule for all procurement items and all Work required to complete this Project.
- B. Network Diagram
  - 1. A diagram representing all the Work for this Project will be prepared by the CPM Consultant showing the priority and interdependence of activities and the sequence in which the Work is to be accomplished as planned by the Contractor. Each segment will be analyzed in sufficient detail by the Contractor, the CPM Consultant, and the Commissioner to insure reasonably accurate time durations. Time units shall be in working days and one day will be the smallest time unit shown. When completed, the network diagram shall represent the Contractor's own plan for the Project, consistent with the contract schedule.
    - a. It shall be the Contractor's responsibility to ensure that all of the Work is described by the network diagram to its satisfaction and that the diagram correctly represents the sequence, means, methods, techniques and procedures by which it plans to perform the Work. The CPM Consultant will assist the Contractor in this review only to the extent to make the Contractor's information compatible with the CPM Consultant's format. Upon completion of the diagram, the CPM Consultant will prepare a computer printout reflecting the schedule.
    - b. Network activities shown on a detailed or sub-network diagram shall include, in addition to construction activities, the submittal and approval of Samples, Shop Drawings, etc.; the procurement of materials and equipment; manufacture and/or fabrication of special material and major equipment, their shop inspection, testing and storage or delivery to the jobsite; installation; preliminary, final and performance testing. All activities and dates for completion of all or part of the Work will be shown. The selection and number of activities shall be subject to the CPM Consultant's review and Commissioner's approval.
  - 2. The Contractor shall prepare and make available to the CPM Consultant all information required within thirty days of the Notice to Proceed. During this time the Contractor shall meet with the CPM Consultant as often as necessary to supply the required information.
  - 3. The following information shall be shown on the diagrams for each activity: preceding and following event number, description of activity, cost and

activity duration. In calculating activity durations, Saturdays, Sundays, Holidays, and normal inclement weather should be considered.

4. **Summary Network:** A summary network diagram consisting of a minimum of fifty activities and a maximum of one hundred activities shall be prepared. The summary network shall be based on and supported by detailed diagrams. Related activities shall be grouped on the network.
5. **Mathematical Analysis:** On completion of the network diagram, the CPM Consultant will have computer input data prepared. A computer run will then be made to generate a schedule for the Project based on the information supplied. In the event that the schedule produced exceeds the contractual date of the Contract or interim specified milestone dates, the CPM Consultant and the Contractor will revise the working plan until a schedule is established that meets the Contract completion date.
  - a. Upon receipt of the Contractor's information, the final working plan and schedule will be completed and submitted to the Contractor and Commissioner for approval. Approval of the final working plan and schedule by the Contractor shall be given within seven calendar days, and no requisition for payment by the Contractor will be processed until approval of the schedule the Contractor is received by the Commissioner.
  - b. The following information will be furnished for each activity:
    - (1) Preceding and following event number
    - (2) Activity description
    - (3) Responsibility for activity (Contractor, Commissioner, etc.)
    - (4) Estimated duration of activity
    - (5) Earliest start date (by calendar date)
    - (6) Earliest finish date (by calendar date)
    - (7) Latest start date (by calendar date)
    - (8) Latest finish date (by calendar date)
    - (9) Slack or float (in calendar days)
    - (10) Monetary value of activity
    - (11) Percentage of activity completed
    - (12) Contractor's remaining cost on portion of activity completed, and original cost
  - c. The analysis shall also list the activities in sorts or groups as follows:
    - (1) By activity number, from lowest to highest.
    - (2) By the amount of float (slack).
    - (3) By earliest allowable start date, with a three month cutoff.

d. The formal computation shall also include the following information, if required of /or by the Contractor:

- (1) Identification of activities which are planned to be expedited by use of overtime or double shifts to be worked including Saturdays, Sundays and Holidays

## 2.02 SCHEDULE REVIEW AND UPDATING

- A. To maintain and aid in the implementation of the schedule, the CPM Consultant will review with the Contractor and the Commissioner the working plan and schedule periodically, at least monthly or more often, as required by the Commissioner for the duration of construction. These meetings are separate and apart from job meetings and coordination meetings. If necessary, the Contractor will take part in a field inspection prior to each update.
- B. All submissions, approvals, fabrication status, as well as Work completed in the preceding month, all Work in progress, and all Work scheduled to be performed during the upcoming months shall be reviewed.
- C. All Change Orders or other information which may affect the Project Schedule shall be checked against the original plan and schedule, and worked into the plan along with delays in any other critical areas as noted. A new computer run will be made to determine the effect, if any, of changes or delays made on the Contract completion date.
- D. Problems having a direct or indirect effect upon the schedule shall be discussed and responsibility for resolution documented.
- E. If the latest completion time for any significant job does not come within the time allowed by the Contract, the sequence of jobs and/or performance of that job shall be revised by the Contractor (with the assistance of the CPM Consultant as required on the format) through concurrent operations, additional manpower, additional shifts, overtime, etc., until the schedule produced indicates that all significant Contract completion and occupancy times will be met. No additional cost will be allowed the Contractor for overtime, additional manpower, equipment, additional shifts, etc. (except as provided elsewhere in the Contract Documents), if such expediting procedures are necessary.
- F. If the Contractor thereafter desires to make changes in the method of operating and scheduling, it shall notify the Commissioner, in writing, stating the reasons for the change.

## 2.03 MONTHLY SUMMARY REPORT

- A. In addition to the updated network and analysis as described, the CPM Consultant will also submit a narrative report with the updated analysis which will include, but

not be limited to, a description of the problem areas, current and anticipated, delaying factors and their impact, and an explanation of corrective actions taken or proposed by the Contractor based on information gathered at the update meetings.

- B. The monthly summary will reflect a cost summary of payments and percent completions for the Contract based on the CPM schedule used as the Contractor's periodic request for payment. The report will state the amount of Work actually completed and the schedule as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates. If the Project is behind schedule, progress along other paths with negative slack shall also be reported.

### PART 3 EXECUTION

#### 3.01 BI-WEEKLY PROGRESS MEETING AND REPORTS

- A. Once every two weeks on a date established by the Commissioner, a job-site progress meeting will be held at which time the schedule will be reviewed. The meeting shall be attended by the Commissioner, the Contractor and the CPM Consultant. The Contractor's representative(s) at the meetings shall have the competence and authority to make any necessary decisions and their statement shall commit the Contractor to the agreed procedures, sequence of operations and time schedules.
- B. Prior to the meeting, the CPM Consultant will obtain through any required means, including site meetings, the necessary information to update the CPM Schedule to reflect progress to date and to update the plan of the work for the balance of the project. The updated Schedule will be available at the meeting for review. To update the CPM Schedule, the Contractor shall:
  - 1. Enter actual start and completion dates, work days, number of shifts, crew size, and equipment used for those activities started and/or completed during the previous reporting period.
  - 2. For activities in progress, indicate the percentage complete to date. Review and revise as necessary the network logic for the balance of the work from the update to the estimated completion date.
  - 3. For activities not yet started, review and revise as necessary, the necessary logic for the durations and the estimated start and completion dates.
  - 4. Enter for each applicable activity, actual installed quantities information and corresponding cost information.
  - 5. Add authorized contract modifications.
  - 6. Annotate updated status information on the CPM Schedule in such a manner that the CPM Schedule shall graphically depict the current status of the Work.

3.02 REMEDIAL MEASURES

- A. If at any time during the project, the Contractor fails to complete any activity by its latest completion date, it will be required, within 7 days, to submit to the Commissioner a written statement as to how and when it plans to reorganize its work force to return to the current CPM Schedule.
- B. The Commissioner may require any Contractor to add to its equipment or construction forces, as well as increase the working hours, if operations fall behind the Contractor's baseline schedule at any time during the construction period.
- C. Under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner or procedure to return to the CPM Schedule be considered justification for contract modification or extra work.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 01330  
SHOP DRAWINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Definition of Shop Drawings
- B. General requirements for submittals
- C. Letter of transmittal
- D. Approval of Suppliers
- E. Shop Drawings submittal
- F. Contractor responsibilities
- G. Approval of Shop Drawings not a waiver
- H. Record-Keeping

**1.02 DEFINITION OF SHOP DRAWINGS**

- A. Shop Drawings shall mean drawings, prints, descriptive literature, test reports, calculations, schedules, materials lists and information such as special drawings, schedules, calculations and curves.

**1.03 GENERAL REQUIREMENTS FOR SUBMITTALS**

- A. The submittal of Shop Drawings and inquiries pertaining to engineering features or specification and Contract Drawing interpretations shall conform to procedures described in the General Conditions and as detailed or modified in this Section.
- B. Shop Drawings shall be provided when specifically required in the Specifications. Performance curves and detailed information on materials shall be provided when requested by the Commissioner.
- C. Samples shall be submitted as described in the General Conditions.
- D. Mock-ups shall be submitted as described in Section 01452 – Mock-Up Requirements.
- E. Submittal shall be made to the Commissioner. All submittals and drawings shall be in the English Language and US Customary Units.

## 1.04 LETTER OF TRANSMITTAL

- A. A letter of transmittal shall accompany all Shop Drawing submittals. A single letter of transmittal may accompany multiple Shop Drawing submittals, including those Shop Drawing submittals that are for different Sections of the Specifications, provided that they pertain to the same item of work. The letter of transmittal shall include the following information for each submittal: Specification Section number, submittal number, review cycle, title/description of the submittal, Shop Drawing source company name (Contractor, Subcontractor, supplier, or manufacturer), and Shop Drawing reference number if applicable. Insofar as possible, letters of inquiry concerning certain phases of the Contract shall also deal with only one Section of the Specifications.
- B. All letters of transmittal shall be sent to the Commissioner in triplicate.
- C. At the beginning of each letter of transmittal and each letter of inquiry, provide a reference heading indicating the following:

OWNER'S Name: NYC Department of Sanitation  
Project Name: \_\_\_\_\_  
Contract Number: \_\_\_\_\_  
Transmittal Number: \_\_\_\_\_

- D. If submittals show variation from the requirements of the Contract, the Contractor shall make specific mention of such variation in his letter of transmittal.

## 1.05 APPROVAL OF SUPPLIERS

- A. The Contractor shall submit the following information in triplicate to the Commissioner within 15 days from the date of Notice to Proceed issued by the Department, and prior to entering into any subcontract for the manufacture or supply of equipment and products:
1. The names and addresses of equipment and product manufacturers and locations of the shops at which the hardware and other items will be manufactured or fabricated.
  2. General descriptions and specifications of the fabricated items.
  3. A statement as to whether the item is already designed or in production.
  4. Any additional information that the Commissioner may deem necessary in order to determine the ability of the manufacturer to produce the equipment as called for by the Contract Documents.
- B. The Contractor shall not enter into any subcontracts or purchase agreements for the furnishing of any equipment and products until he has received the Commissioner's

approval in writing for the acceptance by the Department of the proposed manufacturers.

#### 1.06 SHOP DRAWINGS SUBMITTAL

- A. All Shop Drawings and other data submitted for approval shall have an identifying title.
- B. All Shop Drawings and other data submitted shall bear the stamp of approval and signature of the Contractor as evidence that they have been reviewed and approved by the Contractor and that they conform to the requirements of the Contract Documents. Shop Drawing submittals without this stamp of approval will not be reviewed by the Commissioner and will be returned to the Contractor. The stamp shall contain the following minimum information completed in ink:

Project Name: \_\_\_\_\_  
Contract No.: \_\_\_\_\_  
Contractor's Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Item: \_\_\_\_\_  
Specifications: \_\_\_\_\_  
Section: \_\_\_\_\_  
Page No.: \_\_\_\_\_  
Para. No.: \_\_\_\_\_  
Contract Drawing No.: \_\_\_\_\_ of \_\_\_\_\_  
Location: \_\_\_\_\_  
Submittal No.: \_\_\_\_\_ Review Cycle No.: \_\_\_\_\_

Shop Drawing Reference No.: \_\_\_\_\_  
Source company name: \_\_\_\_\_  
Approved By: \_\_\_\_\_

- C. Shop Drawing Submittal Numbering and Identification: In order to identify and track all Shop Drawing submittals as separate and unique items, the Contractor shall utilize a Shop Drawing submittal identification numbering system as follows:
1. Submittal Number: The Submittal Number shall be a separate and unique number correlating to each individual Shop Drawing that needs to be tracked as a separate and unique item. The Submittal Number shall be a two part, eight character, alpha/numeric number assigned by the Contractor in the following manner:
    - a. The first part of the Submittal Number shall consist of five characters that pertain to the applicable Specification Section number.

- b. The second part of the Submittal Number shall consist of three digits (the numbers 001 to 999) to number each separate and unique Shop Drawing submitted under each Specification Section.
  - c. A dash shall separate the two parts of the Submittal Number.
  - d. As an example, the Submittal Number for the third Shop Drawing submitted under Section 09900 would be 09900-003.
2. Review Cycle: The Review Cycle shall be a three-digit number indicating the initial submission or resubmission of the same Shop Drawing submittal. For example:
- 001 = first (initial) submission
  - 002 = second submission (first resubmission)
  - 003 = third submission (second resubmission)
3. As an example, the Shop Drawing submittal identification numbers for the first submission of the third Shop Drawing submitted under Section 09900 is:

<u>Submittal Number</u>	<u>Review Cycle</u>
09900-003	001

As a second example, the Shop Drawing submittal identification numbers for the second submission of the third Shop Drawing submitted under Section 09900 is:

<u>Submittal Number</u>	<u>Review Cycle</u>
09900-03	002

- D. The Contractor shall initially submit to the Commissioner a minimum of 5 copies of all submittals.
- E. Partial, incomplete, or illegible submissions will be returned to the Contractor without review, for resubmission.
- 1. After the Commissioner completes its review, the Shop Drawings will be stamped as described in the General Conditions
  - 2. Shop Drawings or other submittals not bearing the Commissioner's "Approved" or "Approved - Subject to Corrections Marked" notation shall not be issued to sub- contractors nor utilized for construction purposes. No work shall be performed or equipment installed without an "Approved" or "Approved - Subject to Corrections Marked" drawing or submittal.

- F. In the event the Contractor obtains the Commissioner's approval for the use of equipment other than that which is shown or specified, the Contractor shall, at its own expense and using methods approved by the Commissioner, make all changes to the Work, including structures, piping, and electrical equipment and controls that may be necessary to accommodate this equipment.
- G. Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for time required to make delivery of material or equipment after data covering such is approved. The Contractor shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawings. No materials or equipment will be permitted to be incorporated into the Work nor will such be included in monthly payment estimates until approval thereof has been obtained in the specified manner.
- H. The Commissioner will review and process all submittals promptly, but a reasonable time should be allowed for this, for the drawings being examined and returned for correction, and for time required to return the approved drawings to the Contractor.

#### 1.07 CONTRACTOR RESPONSIBILITIES

- A. It is the responsibility of the Contractor to review submittals made by its suppliers and subcontractors before transmitting them to the Commissioner to assure proper coordination of the Work and to determine that each submittal is in accordance with its desires and that there is sufficient information about materials and equipment for the Commissioner to determine compliance with the drawings and specifications. Incomplete or inadequate submittals will be returned for revision without review.
- B. Approval of Shop Drawings shall not relieve the Contractor from the responsibility of furnishing materials and equipment of proper dimension, size, quality, quantity, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Approval shall not relieve the Contractor from responsibility for errors of any sort on the Shop Drawings. Approval is intended only to determine conformance with the information given in the Contract Documents. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the Work of all trades.

#### 1.08 APPROVAL OF SHOP DRAWINGS NOT A WAIVER

- A. The approval of Shop Drawings submitted by the Contractor shall not constitute a waiver of any of the requirements of this Contract nor shall the City be compelled to accept any structure or apparatus unless it passes all the tests and requirements of the Contract Documents.

- B. All deviations made during construction from final Shop Drawings previously annotated by the Commissioner as "Approved", shall be corrected on the Shop Drawings, and resubmitted to the Commissioner showing conditions as constructed.

1.09 RECORD-KEEPING

- A. Records shall be kept of any changes or adjustments made during manufacture, construction, installation and testing. All affected drawings and material lists shall then be revised by the Contractor, marked, "As-Built Drawing," and be delivered to the Department prior to acceptance of the work by the Department.
- B. The Contractor shall keep one record copy of all Specifications, Plans, Addenda, Supplementary Drawings, Working Drawings, Shop Drawings, Change Orders and any other clarifications at the site in good order. These documents shall be annotated to show all changes made during the construction process, shall be available to the Commissioner and shall be delivered to the Department of Sanitation upon completion of the work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01355**  
**REGULATED MATERIALS CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Regulated materials
- B. Remedial action for unforeseen regulated materials
- C. Payment
- D. Air Monitoring
- E. Temporary services for the environmental remediation work
- F. Decontamination
- G. Submittals for the environmental remediation work
- H. Hazardous Waste Tax

**1.02 RELATED SPECIFICATIONS**

- A. Section 01356 – Safe and Healthful Working Conditions
- B. Section 02224 – Removal of Arsenic-Impacted Wood – Environmental Requirements
- C. Section 02225 – Impacted Soil Handling
- D. Section 02291 – Air Monitoring Program
- E. Section 13287 – Environmental Waste Transportation and Disposition

**1.03 PAYMENT**

- A. The costs for handling, disposition, and remediation of known regulated equipment and materials shall be included in the lump sum bid for Bid Item 1. Known regulated equipment and materials shall include regulated (or potentially regulated) equipment and materials described, listed, referenced or otherwise referred to in the Contract Documents or other documents available for inspection by the Contractor including, but not limited to, the SEIP and geotechnical reports.
- B. The costs associated with the work specified in this section shall be included in the lump sum price for Bid Item 1, except as described below in Paragraph 1.03C.
- C. Payment for unforeseen regulated/hazardous material remediation and disposition work shall be paid out of the Hazardous Materials Remediation allowance. The allowance shall be included by the Contractor in his total bid as shown on the bid form.



1. The allowance shall provide for any extra expenses incurred by the Contractor in implementing the remediation action and the additional health and safety precautions and permitting required to enable construction operations to proceed safely in the presence of unforeseen regulated/hazardous materials.
2. The Contract allowance may be used to pay for development and implementation of remediation plans to address the presence of unforeseen regulated/hazardous materials discovered at the project site.
3. All costs associated with amending the site-specific Health and Safety Plan (HASP) to account for the presence of unforeseen regulated/hazardous materials and for the implementation of the amended HASP shall be paid under the Contract allowance.
4. Payment for transportation and disposal of unforeseen regulated/hazardous materials will not be made until executed copies of waste disposal documentation (with complete chain of custody) are submitted to the Commissioner.
5. Payment for allowance items described above will be made in accordance with the provisions of Article 25 of the Standard Construction Contract. The balance of the allowance not expended will be retained by the City of New York of New York.
6. This Contract allowance is intended for addressing the presence of unforeseen regulated/hazardous materials and for payment of hazardous waste tax only. The Contract allowance will not be used to cover the cost of remediation of known regulated (and potentially regulated) equipment and materials. The cost of the hazardous waste tax will be paid in accordance with Article 1.10 of this Section.

#### 1.04 REGULATED MATERIALS

- A. Regulated materials and equipment that require special handling and disposition have been identified at the site. Several organic constituents and inorganics were detected at concentrations above their respective laboratory detection limits in soil and groundwater and sediment samples collected at the site as part of the environmental investigation conducted in 2003 by Blasland, Bouck & Lee, Inc. (BBL). For more details regarding approximate quantities, locations, and conditions of known regulated equipment and materials and concentrations of chemical constituents detected in environmental samples collected at the site, refer to the Supplemental Environmental Information Package (SEIP) included on the Supplement Reports CD provided with the bid documents. The SEIP includes summary tables presenting comparisons of the concentrations detected in soil, groundwater, and sediment with worker health and safety regulatory threshold

limit values. The SEIP is provided for informational purposes only and is not part of the Contract.

- B. Known regulated (and potentially regulated) materials described, listed, referenced, or otherwise referred to in the Contract Documents or in other documents available for inspection by the Contractor (not part of the Contract), shall be handled and disposed as specified elsewhere in applicable Sections, including, but not limited to, Section 02224, Section 02225, and Section 13287.
- C. The Contractor shall verify site conditions in order to develop an understanding of the conditions that may be encountered during performance of the work. Failure by the Contractor to verify existing site conditions shall not result in additional costs to the City of New York of New York.

#### 1.05 UNFORESEEN REGULATED MATERIALS

- A. The possibility exists that unforeseen regulated/hazardous materials (i.e., not listed in the Contract Documents or in the other documents available to the Contractor [e.g., SEIP]) will be encountered at locations where their presence could not be determined prior to the performance of the work. The Contractor shall be responsible for identifying additional suspect regulated/hazardous materials as they are encountered (if any). If additional suspect regulated/hazardous materials are encountered, this information shall be immediately reported by the Contractor to the Commissioner. If determined by the Commissioner to be warranted, the Commissioner will perform investigation activities and develop a remediation plan for addressing the regulated/hazardous materials encountered. If requested by the Commissioner, the Contractor shall assist the Commissioner in performance of the investigation and shall participate in the development of the remediation plan.
- B. Upon defining the scope of the remedial action for addressing additional regulated/hazardous materials, the Contractor will be requested to provide a cost proposal for addressing the additional regulated/hazardous materials in accordance with the remediation plan. The Contractor shall submit the cost proposal to the Commissioner within 10 calendar days from the date the Contractor receives such directive. Remediation work shall not commence until the Contractor receives written notice from the City of New York of New York to proceed with the work.
- C. Some of the remediation work may be critical to maintaining construction schedules. When this occurs (as determined by the Commissioner), the Commissioner will establish a time of completion.
- D. In the event that previously uncharacterized regulated/hazardous materials are encountered, the Contractor shall be responsible for waste characterization (as necessary), obtaining permits, profiling, manifesting, segregating, handling, containerizing, loading, transporting, and disposing offsite all additional

regulated/hazardous materials encountered. The work shall be performed by the Contractor in accordance with applicable regulations and requirements presented elsewhere in the Contract Documents, as applicable.

- E. Payment for remediation of unforeseen regulated materials will be made from the allowance described above in Paragraph 1.03C.

#### 1.06 AIR MONITORING

- A. Air monitoring shall be conducted in accordance with applicable regulations and provisions specified elsewhere in the Contract Documents, as applicable.

#### 1.07 TEMPORARY SERVICES

- A. The Contractor shall be responsible for the construction of support area(s), waste staging area(s), and decontamination area(s) in accordance with reviewed documentation provided by the Contractor. At a minimum, the decontamination area(s) shall be bermed and lined with two layers of polyethylene sheeting and sloped to a lined sump (minimum 1 foot depth) to allow for the collection of decontamination liquids. Precautions to protect the integrity of the low-permeability liner of the decontamination area(s) (e.g., installation of a geotextile or rubber roofing material over the liner) shall be required.
- B. The Contractor shall make provisions to mitigate any offsite tracking of materials (e.g., onto public roadways), as necessary. At a minimum, vehicle decontamination shall be as specified in Section 02371 – Dust, Soil Erosion and Sedimentation Control.
- C. The Contractor shall be responsible for acquiring all applicable permits (including fees) and providing all applicable notifications (e.g., local, state, federal) necessary to complete the environmental remediation work specified in the Contract Documents.
- D. The Contractor shall be responsible for coordinating the deactivation of utilities with the utility company(ies), as necessary, to perform the work.

#### 1.08 DECONTAMINATION

- A. All Contractor's (and their subcontractor's) equipment mobilized to the site shall be thoroughly cleaned prior to mobilization to the site. Based upon review by the Commissioner, equipment that is not visibly clean upon site mobilization shall be taken offsite and cleaned by the Contractor prior to remobilization at no additional cost to the City of New York.
- B. All non-disposable equipment that has been used during implementation of the project and has come in contact with regulated (e.g., Resource Conservation and Recovery Act- [RCRA-], Toxic Substances Control Act- [TSCA-], and/or State of

New York-regulated) materials shall be decontaminated before being removed from the site. Equipment decontamination shall be performed in a designated area (to be proposed by the Contractor and reviewed by the Commissioner). Decontamination of non-disposable equipment that does not come into contact with site-related liquids/semi-liquids (e.g., oils, petroleum) shall be deemed complete based on a visual observation by the Commissioner. Equipment that does not meet the "visibly clean" objective, as determined by the Commissioner, shall be recleaned by the Contractor at no additional cost to the City of New York. Non-disposable equipment that comes into contact with any site-related liquids/semi-liquids shall be decontaminated prior to reuse and/or removal from the site. Decontamination of such non-disposable equipment shall be conducted using a minimum of appropriate and industry-recognized non-toxic decontamination materials. Decontamination shall take place in a separately constructed decontamination area suitable for the size of the equipment to be decontaminated and using materials appropriate for the collection of the site-related liquids/semi-liquids and the decontamination materials. The Contractor shall be responsible for the collection, containerization, characterization, profiling, transportation, and disposal of the decontamination wastes in accordance with all applicable laws, rules, and regulations and these Contract Documents.

- C. Following completion of decontamination activities, the Contractor shall place all materials generated as a result of the equipment decontamination into United States Department of Transportation- (USDOT-) approved containers for subsequent characterization, transportation, and offsite disposal (by the Contractor) in accordance with Section 13287 - Environmental Waste Transportation and Disposition and applicable laws, rules, and regulations.

#### 1.09 SUBMITTALS

- A. At least 30 calendar days prior to the commencement of the environmental remediation work, the Contractor shall submit the following items for review:
  - 1. Site Management Plan. The purpose of the Site Management Plan is to summarize the materials, procedures, and controls that the Contractor intends to utilize during implementation of the environmental remediation work. The Site Management Plan shall address pertinent project and site management issues, items, and topics and shall be of sufficient detail to allow the Commissioner to fully understand the Contractor's proposed approach for completing all environmental remediation work required under the Contract. The plan shall include, but shall not be limited to, the following:
    - a. Copies of all applicable permits necessary to complete the environmental remediation work specified in the Contract.
    - b. A Project Management Chart presenting the names, titles, office locations, and office and cell phone numbers of individuals responsible

for conducting the environmental remediation work activities. At a minimum, the chart shall include the Contractor's responsible corporate officer, the office project manager, the site project manager(s)/superintendent(s), and the HASP author.

- c. A bar-graph-type schedule presenting the Contractor-proposed sequence for implementing environmental remediation work and the time required to complete each work activity from the award of the Contract. The schedule shall be prepared and revised as specified in the Standard Construction Contract, Articles 9 and 11, and coordinated with the CPM schedule described in Section 01321 – Construction Progress Scheduling.
  - d. A list of equipment to be mobilized to the site to perform the environmental remediation work.
  - e. Provisions for the safety, security, and protection of all adjacent properties.
  - f. The plan for controlling vehicular and pedestrian traffic at the entrance to the site during work activities.
  - g. A plan for the protection of Contractor-supplied materials and equipment and all waste materials to be generated during implementation of the environmental remediation work, plans for noise control, and plans for dust control measures.
  - h. Plans and sections depicting locations, sizes, and materials of construction for the Contractor-proposed staging areas, onsite storage areas, and decontamination areas.
  - i. Methods and materials to be used to mitigate offsite tracking of site-related materials.
  - j. A list of anticipated waste streams to be generated as a result of the environmental remediation work and anticipated waste volumes. Inaccuracies in the Contractor's estimate will not entitle the Contractor to additional money under this Contract.
  - k. Proposed methods for handling, containerizing, labeling, and loading each waste stream.
2. Contingency Plan. The Contractor shall prepare, submit, and implement a Contingency Plan that includes, at a minimum, the following items:
- a. A Spill Prevention Control and Countermeasures Plan for all materials brought to the site and for any liquids that may potentially be

encountered or handled during the environmental remediation work (including liquids requiring removal and liquids that remain/may be present at the site). Such liquids shall include, but not be limited to, oils within ballasts, residual liquid in bulbs, oil in equipment reservoirs, liquids in containers, and liquids in tanks and tank systems.

- b. Emergency vehicular access/egress.
  - c. Evacuation procedures of personnel from the work site.
  - d. A list of all contact personnel with mobile and office phone numbers, including the City of New York, the Commissioner, the Contractor, fire officials, ambulance service, local and state police, and local hospitals, including routes to local hospitals and procedures for notifying each. During the first day of work at the site, the Contractor shall drive the route to the hospital. Each of the Contractor's subcontractors shall drive the route to the hospital during their first day of work at the site.
  - e. Identification of responsible personnel who will be in a position at all times to receive incoming phone calls and to dispatch Contractor personnel and equipment in the event of an emergency situation.
3. Decontamination Plan. The Contractor shall prepare, submit, and implement a Decontamination Plan that identifies the following:
- a. Methods, procedures, and equipment to be employed during decontamination of personnel and equipment that have come in contact with impacted site media.
  - b. Generation, collection, and handling of solids, liquids, personal protective equipment (PPE), and other related wastes to be generated by decontamination/cleaning activities. Equipment and personnel decontamination activities shall be performed in areas to be designated by the Contractor and reviewed by the Commissioner.
4. Water Protection Plan. The Contractor shall prepare, submit, and implement a Water Protection Plan. The Water Protection Plan shall include a description of engineering controls (e.g., physical barriers) that the Contractor proposes to install and maintain to mitigate the release of any materials or debris into adjacent water bodies (either directly or indirectly) during implementation of the environmental remediation work. In the event of a release, the Contractor shall provide labor, equipment, and materials to perform emergency measures to contain releases, and to remove regulated materials for offsite disposal at no additional cost to the City of New York. The Water Protection Plan shall include a description of emergency measures the Contractor proposes to implement in the event of a release.

5. Submittals required in the following Sections:
- a. Section 01356 – Safe and Healthful Working Conditions. In addition to the submittal requirements specified in this Part, the Contractor shall comply with the submittal requirements presented in Section 01356.
  - b. Section 02224 – Removal of Arsenic-Impacted Wood – Environmental Requirements
  - c. Section 02225 – Impacted Soil Handling
  - d. Section 02291 – Air Monitoring Program
  - e. Section 13287 – Environmental Waste Transportation and Disposition
- B. Items shall be submitted for review in accordance with the submittal procedures for shop drawings specified in Section 01330 – Shop Drawings.
- C. The Commissioner will review the submittals to determine general compliance with the Contract conditions. The Commissioner's review shall in no way be construed as permitting any departure from the Contract, except where the Contractor has previously requested and received written approval from the Commissioner for such departure. The Commissioner's review does not relieve the Contractor of any responsibility to comply with applicable laws, rules, and regulations. The Contractor will not be permitted to undertake any activity that is directly or indirectly related to the item covered by the submittal until such time that the Commissioner provides notification to the Contractor.
- D. Submittals will be reviewed and marked by the Commissioner as specified in Section 01330 – Shop Drawings.
- E. Contractor's HASPs as required in Section 01356 – Safe and Healthful Working Conditions, shall be submitted for recordkeeping purposes only. A formal review of the HASPs will not be performed by the Commissioner.

#### 1.10 HAZARDOUS WASTE TAX

- A. The Contractor may be directed to pay the City of New York's New York State Hazardous Waste Tax assessment from the Regulated/Hazardous Material Remediation allowance. When directed by the Commissioner, the Contractor shall pay the amount indicated to the New York State Department of Taxation and Finance within 48 hours of notification. The Contractor will be reimbursed for the amount paid (if any), with no provision for overhead and profit, from the Hazardous Material Remediation allowance. If the Contractor is not directed to pay the City of New York's New York State Hazardous Waste Tax, then the Contractor shall supply all necessary documentation (e.g., completed manifests as

per Section 13287 – Environmental Waste Transportation and Disposition) to the Commissioner.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**-END OF SECTION-**



**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

**NO TEXT ON THIS PAGE**

**Section 01410**  
**REGULATORY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Inspection by City of New York, State and Federal Government
- B. Work permits
- C. Bureau of Electrical Control
- D. Existing utilities
- E. Existing flows
- F. Disposal of water
- G. Conformance to Industrial Code
- H. Conformance to other codes and standards

**1.02 INSPECTION BY THE CITY OF NEW YORK, STATE AND FEDERAL GOVERNMENT**

- A. The Contractor shall provide proper facilities for inspection and access to the work at all times, whenever it is in preparation and progress, for authorized representatives of the City of New York, State and Federal Governments, the latter two in the presence of the Commissioner.

**1.03 WORK PERMITS**

- A. All New York City Building permits required for work under this Contract shall be obtained by the Contractor within six (6) months of Contract Notice to Proceed. Contractors shall be responsible for all costs associated with the resubmission of Building Permits applications if they fail to obtain permits within six (6) months of Contract Notice to Proceed.
- B. The Contractor shall obtain, maintain and pay for all necessary local, state and federal permits, licenses, certificates of inspection, city water connection permits and shall give all notices and pay all legal fees to City Departments in connection with the work of his Contract. The Contractor shall also be responsible for renewing these permits as often as necessary until the completion of the work and shall be responsible for the associated cost.

- C. All work performed under the Contract shall conform to the rules and regulations of the Bureau of Electrical Control, Department of Buildings; New York City Construction Codes, the New York City Plumbing Code, regulations of the Department of Air Resources, and all other City of New York, State and Federal Departments having jurisdiction.
- D. Upon completion of the various stages of construction, the Contractor shall schedule inspections and obtain certificates of approval and/or acceptance from the various agencies and Departments having jurisdiction and shall deliver these certificates to the Commissioner.

#### 1.04 BUREAU OF ELECTRICAL CONTROL

- A. The Contractor, as mandated by law, shall make application for a certificate of electrical inspection to the Bureau of Electrical Control for electrical work furnished under this Contract. Proof of filing for the certificate shall be submitted to the Commissioner in the form of the pink copy of the job posting card issued by the Bureau at the time of application. Such proof shall be submitted within fifteen (15) days after the date upon which the Contractor is notified by the City of New York to Commence Work.
- B. After completion of his work, the Contractor shall notify the local Borough Office in the Bureau of Electrical Control, Department of Buildings, by letter, requesting that a final inspection be made.
- C. Prior to final payment, there must be filed in the Office of the Comptroller of the City of New York a Certificate of Inspection signed by the Borough Superintendent of the Bureau of Electrical Control which shall certify that:
  - 1. All material and workmanship comply in every respect with the rules and regulations of the Bureau of Electrical Control and the New York City Electrical Code.
  - 2. All materials and workmanship comply in every respect with the Contract Documents approved by the Bureau of Electrical Control and fulfill the intent thereof.

#### 1.05 EXISTING UTILITIES

- A. All subsurface utility and structure information shown on the Contract Drawings was obtained from various plans, maps and field investigations; however they are not guaranteed to be complete or accurate. It shall be the Contractor's responsibility to locate all such necessary utilities or structures by the digging of test pits prior to the start of construction. No separate payment will be made for test pits.

- B. During the progress of the work, the Contractor shall protect from damage any existing utilities or services within the work areas until, they have been re-routed, disconnected or capped off.

#### 1.06 EXISTING FLOWS

- A. The Contractor shall, as approved by the Commissioner, provide and construct flumes, temporary sewers, dams and all incidental and related facilities necessary to divert or otherwise take care of groundwater and surface drainage, and to prevent any sediments from being conveyed into the existing storm sewer inlets or water courses.

#### 1.07 DISPOSAL OF WATER

- A. Water from open cut and/or sheeted excavations, manholes, structures, trenches, or from whatever source, shall be disposed of strictly in accordance with methods approved by the Commissioner.
- B. The Contractor shall submit proposed dewatering methods to the New York State Department of Environmental Conservation for the required permits. If a well point dewatering system is proposed, the Contractor shall utilize a licensed well driller. Contractor shall contact NYSDEC a minimum of 2 weeks in advance of dewatering system startup. All dewatering shall be in accordance with Section 15-1525 of the Environmental Conservation Law.
- C. When required by the Commissioner, such water shall be passed through a settling basin of acceptable size and shape and equipped with an overflow. Each settling basin shall be cleaned as required and as ordered by the Commissioner.
- D. Sufficient water to flush all sewers and drains shall be provided by the Contractor when necessary. If any sewer, drain, catch basin, inlet or gutter, that receives dirty water attributable to the Contractor's operations, should become filled or partially filled with sediment or debris, the Contractor shall promptly and satisfactorily remove such deposits.

#### 1.08 CONFORMANCE TO INDUSTRIAL CODE

- A. The Contractor's attention is directed to requirements of the Industrial Code of the State of New York, Department of Labor, Board of Standard and Appeals, latest edition and amendments or supplements thereto. All mechanical equipment with respect to manufacture, fabrication, and safety devices for protection of personnel from electrical parts and mechanically moving parts such as belts, shafts, couplings, and other apparatus, appliances or equipment, all floors, stair surfaces, ladders, equipment, access stairs and platforms, all exit enclosures, vertical openings and stairs, shall comply with this code; and all provisions therein shall be deemed included in and required by these specifications and shall be detailed for approval

and furnished without additional cost; the price thereof considered to be included in the applicable prices bid for the various Contract Items in the Contracts.

- B. For the convenience of the Contractor, the following Rules and Bulletins of the Industrial Code have been listed:

Rule No. 2 Exit enclosures, vertical opening and floors in factory buildings.

Rule No. 16 Floor and stair surfaces, railings and toeboards.

Rule No. 19 Guarding of dangerous machinery, vats and pans.

Bulletin No. 8 Construction, guarding, equipment, maintenance and operation of elevators, dumbwaiter, escalators, hoists and hoistways in factories, and mercantile establishments.

#### 1.09 CONFORMANCE TO OTHER CODES AND STANDARDS

- A. All devices, materials and installations shall conform to the current applicable requirements of the Administrative Code of the City of New York, the National Electrical Code (NFPA-70), ANSI, ASTM, IEEE, NEMA, OSHA, UL, the Contract Documents and the documents specified elsewhere in the specifications.
- B. The City of New York codes shall be followed in case of conflict. Latest edition of all codes shall apply.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01415**  
**MISCELLANEOUS REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Seismic Requirements
- B. General mechanical requirements
- C. Diagrammatic drawings
- D. Ratings approximate
- E. Electrical equipment, special requirements
- F. Uniform finishes
- G. Temporary Support Structures

**1.02 DEFINITION**

- A. "Concealed" piping and ducts shall mean piping and ducts hidden from sight in masonry or other construction, in floor fill, trenches, partitions, hung ceilings, furred spaces, pipe shafts and in service tunnels not used for passage.

**1.03 SEISMIC REQUIREMENTS**

- A. The Contractor is advised that all equipment and appurtenances furnished and installed for this project shall be subject to the requirements of New York City Seismic Zone 2A for seismic loadings.
- B. Working drawings shall indicate that the equipment, equipment pads, piping, piping hangers and supports and all anchors required for a complete installation are capable of withstanding the seismic loadings.

**1.04 GENERAL MECHANICAL REQUIREMENTS**

- A. Where piping and ducts run in areas which have hung ceilings, such piping and ducts shall be installed in the hung ceilings.
- B. The Contract Drawings are in part diagrammatic and show the general arrangement of the equipment, ducts and piping included in the Contract and the approximate size and locations of the equipment. The Contractor shall follow these Drawings in laying out the Work and shall consult the Drawings of the other Contracts to

familiarize himself with all conditions affecting his work and to verify the spaces in which it will be installed.

- C. Connections to existing piping shall be made to permit ready disconnection of equipment with minimum disturbance of adjoining piping and equipment. The Contractor shall be responsible for the exact alignment of all piping with the associated equipment and under no circumstances will pipe springing be allowed.

#### 1.05 DIAGRAMMATIC DRAWINGS

- A. Various pipelines are shown on the Contract Drawings in diagram form. Where such pipelines are shown in diagram form, they shall be arranged clear of other pipelines, equipment and walking areas, and shall be accessible for maintenance. Such pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved working drawings. An adequate number of unions shall be provided in main pipe and branch pipe runs to facilitate dismantling or removal of pipeline sections without disturbing adjacent branch or connecting lines.
- B. The final locations of valves, fittings and other such appurtenances included as a part of diagramed pipelines shall be as shown on approved working drawings or as determined in the field by the Commissioner.
- C. Diagramed pipelines shall be furnished, fabricated, erected and otherwise installed to lines, elevations, locations and dimensions as shown, specified or required for a complete installation. The Contractor shall verify all dimensions shown on the Contract Drawings and shall take such field dimensions as may be necessary to properly show on working drawings and install all diagramed pipelines.
- D. In the vicinity of overhead roll-up doors and truck ways all pipe, conduit and appurtenances shall be installed a minimum of 14'-0" above the finished grade or floor elevation, and a minimum of 8'-0" above the finished grade or floor elevation in all walking areas.
- E. Electrical conduits and wiring are in part diagrammatic and show the general arrangement and routing of conduits and wiring and the approximate size and location of devices included in the Contract. The Contractor shall follow the intent of these drawings in laying out the work. The Contractor shall verify the spaces allocated in which his work will be installed.

#### 1.06 RATINGS APPROXIMATE

- A. The ratings of the devices shown on the Electrical Drawings are approximate only and are merely indicative of the probable power requirements insofar as they can be determined in advance of the purchase of devices. The ratings of the devices furnished may be either increased or decreased according to the requirements of the equipment furnished.

- B. The Contractor shall verify the exact rating of each device before performing the work required under his Contract and modify the size of conduit, wiring and control equipment accordingly.

#### 1.07 ELECTRICAL EQUIPMENT - SPECIAL REQUIREMENTS

- A. All electrical equipment and devices manufactured and furnished under this Contract shall be of type that have been in satisfactory operation for not less than three years, except as provided in Article 5 (Materials & Equipment) of the General Conditions. Whenever similar devices or appliances are furnished, they shall be of one manufacturer and interchangeable within their ratings. If this is not feasible, the Contractor shall submit a statement for each manufacturer supplying devices, certifying the following:
  - 1. That he recommends the use of the device or devices for the specific function to be performed;
  - 2. That he fully guarantees the satisfactory operation of the device or devices in conjunction with the other elements of the equipment.
- B. Whenever standard devices or devices of a named manufacturer do not exactly fulfill the specified conditions, they shall be modified or special devices shall be furnished. All electrical devices furnished under the Contract shall be housed in metal enclosures with provisions for threaded conduit connections. The enclosures shall be designed to protect all electrical parts from local conditions.
- C. The ratings of motors and devices given in various Specification sections are approximate only and merely indicate the probable power requirements insofar as they can be determined in advance of the purchase of the equipment specified. The ratings of the motors and other devices furnished may be either increased or decreased according to the requirements of the equipment furnished and the Contractor shall verify the exact rating of each item of equipment before performing the work required under this Contract.
- D. Float switches, limit switches and other mechanically actuated electrical devices shall consist of an approved electrical system housed in rugged metal enclosures. They shall be adjustable without disturbing conduit connections. The switch actuating mechanism shall be mechanically and structurally correct for the required service and shall not subject the electrical parts to unnecessary stress or mechanical shock. Operating shafts shall be bushed and stuffed in dust-tight cases.
- E. The Contractor shall, unless otherwise directed, furnish and assemble all special lamps, indicating lamps, annunciator lamps and pilot lamps with all accessories.
- F. Electrical equipment rated greater than 1,000 watts and lighting equipment greater than 15 watts with an inductive reactance load component, shall have a power factor of not less than 85% under rated load conditions. Electrical equipment with a



power factor less than 85% shall be corrected to at least 85% under rated load conditions. Installed power factor corrective devices shall be switched with utilization equipment.

- G. Wire terminals on manufactured assemblies such as switchboards, bench boards, control panels, alarm boards, and motor control equipment shall consist of cup terminals, pronged washers, compression type solderless connectors or pressure type terminals furnished on devices.
- H. All control and indication wires within switchboards, control centers and other panels and cabinets shall be terminated on terminal blocks provided with marking strips for wire designation. The manufacturer shall identify all wires on the marking strips. All field wires will be terminated and identified by the Electrical Contractor.
- I. Provision shall be made for wire and cables installed at the plant site to be terminated by the Electrical Contractor with approved solderless copper alloy lugs. Lugs may be of the compression type, clamp type or screw type with internal pressure bar, or may be pressure-tool applied solderless connectors. Pressure tool applied solderless connectors for wires 250 MCM or larger shall have long barrels to allow double indentation. Where clamp type or screw type lugs are installed on wires 1/0 AWG and larger, wire ends shall be filled with solder, contact surfaces of lugs shall be tinned and heat shall be applied when the lugs are tightened.
- J. The Contractor shall consult with the manufacturer or his representative to assure that the electrical items will have a shelf life of at least ten (10) years. Polychlorinated biphenols (PCBs) shall not be used in any equipment on this project. Manufacturers shall have maintenance facilities in the New York City metropolitan area.
- K. All electrical equipment and work shall be in accordance with the Electrical Code of the City of New York. The Contractor shall submit proof to the Commissioner of application for an electrical inspection certificate for equipment furnished under this Contract in accordance with Article 1.37 of the General Conditions.

#### 1.08 UNIFORM FINISHES

- A. A uniform finish shall be used for all hardware, metallic nameplates and similar exposed metal parts used on any equipment or group of equipment and, as far as possible, the same finish shall be used for all such equipment items.

#### 1.09 TEMPORARY SUPPORT STRUCTURES

- A. The Contract Drawings show suggested design and construction requirements for the temporary support structures. The Contractor may submit an alternate design of any temporary support structure for approval by the Commissioner. The Commissioner may accept or reject the alternate design if the structure is not

considered temporary or if it may impose instability to the adjacent existing structure due to lateral and vertical movements. The alternate design of the temporary support shall be performed, signed and sealed by a Professional Engineer licensed in the State of New York who is qualified to determine the extent of work necessary to satisfy the temporary support requirements.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 01431**  
**QUALITY ASSURANCE INSPECTION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Quality assurance inspection
- B. Materials compliance
- C. Witnessed shop tests

**1.02 PAYMENT**

- A. The cost of scheduled witnessed shop test inspections as listed in Article 1.04 shall be included in each Contractor's lump sum bid.
  - 1. For the equipment to be witnessed shop tested, whether of foreign or domestic manufacture, the Contractor shall be responsible for the costs for two employees of the City of New York including all transportation, food, lodging and miscellaneous expenses for each witnessed shop test.

**1.03 MATERIALS COMPLIANCE**

- A. All materials and equipment submitted for approval by the Contractor shall have, at the time of their submittal, a current Report of Material and Equipment Acceptance from the New York City Department of Buildings, Materials and Equipment Acceptance Division, indicating acceptance of the item submitted for approval for its specified use.

**1.04 WITNESSED SHOP TESTS**

- A. Scheduled Witnessed Shop Tests: The following equipment shall be witnessed shop tested.

<u>Specification</u>	<u>Equipment</u>
14511	Container Transport System
14630	Maintenance Bay Bridge Crane
14640	Container Gantry Crane
14695	Constant Tension Mooring Winch
14696	Mooring Capstan
17101	SCADA System
13921	Fire Pumps
16230	Emergency Generators

<u>Specification</u>	<u>Equipment</u>
16430	480-Volt Switchgear

- B. Contractor shall notify the Commissioner at least four (4) weeks in advance of all scheduled witnessed shop tests to be conducted within the continental United States. Contractor shall notify the Commissioner at least six (6) weeks in advance of all scheduled witnessed shop tests to be conducted outside of the continental United States.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01435  
MONITORING SURVEY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of furnishing all labor, equipment, material and services required to perform the work specified herein. The work includes but is not limited to:
  - 1. Condition Survey: This work shall consist of performing structure condition survey(s) and preparing permanent records prior to the commencement of work, after completion of work, and at locations and times during construction as directed by the Commissioner. At a minimum, unless otherwise indicated in the contract documents, include all permanent structures within 25 feet of the construction limit line.
  - 2. Vibration Monitoring: This work shall consist of performing vibration monitoring of background and construction activities by use of seismograph instrumentation and preparing daily and summary report(s) of vibration readings during periods of demolition and construction operations which generate vibration.
  - 3. Position and Crack Monitoring Baseline: Establishing, maintaining, and developing a baseline of initial crack widths, elevations and coordinates of survey monitoring points.
  - 4. Locating and establishing remote survey benchmarks to be used in the work.
  - 5. Measuring and reporting periodic crack gage readings and elevations and coordinates of survey monitoring points.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02364 – Steel Pipe Piles
- B. Section 02365 – Composite Tapered Piles
- C. Section 02390 – Fender Piles
- D. Section 02457 – Steel Sheet Piles
- E. Section 02464 – Timber Piles

**1.03 SUBMITTALS**

- A. Submit the following in accordance with Section 4 of the General Conditions and Section 01330 - Shop Drawings:

1. Shop drawings showing monitoring point and benchmark locations and details.
2. Names and credentials of surveyors performing the work.
3. Survey records of each monitoring point reading no later than one day after readings are taken. Records shall include list of monitoring points with initial and interim coordinates and elevations, and cumulative movement, both vertical and horizontal for each point surveyed.
4. Catalog cuts of crack gages.
5. Condition Survey detailing structures affected by the work, existing field conditions, cracks to be monitored and drawings detailing actual dimensions.
6. Pre-construction survey for background vibration.
7. Monitoring Scope
  - a. The scheduled start dates and lengths of construction operations which require vibration and survey monitoring.
  - b. The limits of vibration and survey and crack monitoring work, including sites on or off the project boundaries.
  - c. The location of all structures to be monitored in proximity to the construction operation.
  - d. The location of any underground or underwater utilities in proximity to the construction operation.
8. Vibration Monitoring Plan prepared by the instrumentation specialist shall be submitted to the Commissioner or approval. The vibration monitoring plan shall include, but not be limited to, the following items:
  - a. Experience and Equipment
    - (1) The name and brief resume of vibration monitoring specialist.
    - (2) Submit proof and details, as references, of two projects in the past three years where the vibration monitoring consultant performing the work has satisfactorily monitored construction operations by recording maximum Peak Particle Velocities (PPVs) and frequency. Include contact information for each reference.
    - (3) Submit information on the required 3-component seismograph, capable of measuring frequency and particle velocity data in three

mutually perpendicular directions, including: the manufacturer's name, model number, and documentation of factory calibration performed within the last 12 months.

b. Methods and Procedures

- (1) The location of adjacent structures to be monitored. If not otherwise specified, a maximum allowable PPV in accordance with the United States Bureau of Mines (USBM) Vibration Criteria (Figure 1) shall be observed at all structures.
- (2) The location of seismograph(s) placements, as directed by the instrumentation specialist, and where allowed by the owner and approved by the Commissioner.
- (3) Appropriate details for anchoring the geophone(s).
- (4) The procedure for tracking PPV throughout construction operations.

- B. Notify the Commissioner immediately in accordance with the Action Plan shown in Table 1 of Article 3.04 if movements or vibrations exceeding limits specified therein are detected.

1.04 PROJECT CONDITIONS

- A. Survey readings shall be made by a licensed Professional Land Surveyor registered in the State of New York.
- B. All readings shall be made in coordination with ongoing construction activities.
- C. Refer readings to the project coordinate system and datum.
- D. Comply with regulations and directives of the New York City Department of Buildings with regard to new foundation work in close proximity to existing foundations.

1.05 MOVEMENT CLASSIFICATION

- A. Maximum permitted movement of any structure shall not exceed 0.5 inches, unless otherwise defined in the Contract Documents.
- B. Maximum permitted change in crack width identified in the Condition Report and monitored with crack gages shall not exceed 0.10 inches.



1.06 STRUCTURE EXAMINATION

- A. Prior to starting work, the Contractor, the City of New York and the Commissioner shall make a joint inspection of the existing structures to examine and document their present conditions.
- B. Photographs shall be taken by the Contractor to record any exterior or interior conditions of a structure that may become the subject of damage claims.
- C. Prepare a Condition Report for each structure documenting all pre-existing conditions, verified by photographs, and signed by the personnel of the Contractor, the City of New York and the Commissioner participating in the investigation.

PART 2 PRODUCTS

2.01 CONDITION SURVEY EQUIPMENT

- A. Provide general photography and video equipment, analog or digital, capable of illuminating, zooming in, focusing on damage with scale bar indicators as necessary and superimposing the date and time on all images.
- B. Crack Gages: Grid type crack monitors as manufactured by Avongard Products (USA) Ltd; or approved equal. Anchors, bolts, screws, and quick-setting epoxy shall be provided as recommended by crack gage manufacturer.

2.02 VIBRATION MONITORING EQUIPMENT

- A. Provide 3-component seismographs, capable of measuring frequency ranging from 2 Hz to 250 Hz and particle velocity data down to 0.05 inches per second in three mutually perpendicular directions.
- B. Seismographs shall have been factory calibrated within past twelve (12) months. If seismographs show any indication of damage or vandalism or if the internal calibration indicates errors, as determined by the Commissioner, the seismograph shall be immediately re-calibrated in the factory or replaced.

PART 3 EXECUTION

3.01 PREPARATION

- A. Engage the services of a firm capable of furnishing a New York State licensed Professional Engineer to conduct a condition survey of the existing structure(s) and an experienced vibration monitoring specialist qualified in field instrumentation, to develop, install, operate, maintain, measure, interpret, and report results prior to and during construction operations.

- B. For position monitoring, establish and maintain at least two (2) remote permanent benchmarks and other reference points at approved locations, as required.
- C. Position monitoring points shall be located on the site at 50 feet on center at above ground structures and underground utilities. The monitoring points shall consist of a suitable mark, not anticipated to be subject to fading, damage or removal. Monitoring points for underground structures and utilities shall consist of a suitable mark or fixture at ground surface not easily removed or damaged. Provide a suitable numbering scheme, giving each point a unique identification number.
- D. Take initial reading, including background vibration, of all monitoring points and crack gages one week before construction activity in the area begins.

### 3.02 CONDITION SURVEY

- A. Provide, as a minimum, the following information:
  - 1. Photographic and video documentation of the interior and exterior condition of the structure(s) within the limits specified or as directed by the Commissioner.
  - 2. Extent and location of existing signs of potential structural distress such as cracks, spalling, loss of section, signs of settlement, flooding, leaking, etc.
  - 3. Descriptions and locations of crack monitors installed.
- B. The Commissioner may accompany the Contractor on each condition survey for verification of the data recorded. Provide two copies of all documentation of each condition survey to the Commissioner.

### 3.03 VIBRATION MONITORING

- A. As directed by the vibration specialist, perform continuous vibration monitoring during construction operations expected to cause vibration. This includes, but is not limited to, construction operations specified in Sections 02364, 02365, 02390, 02457 and 02464. Conduct the work in a manner that will limit construction vibration at the specified locations to within the limits specified herein.
- B. Inform the Commissioner immediately each time measured particle velocities exceed 85% of the allowable peak particle velocity as indicated in Figure 1. Make equipment or procedural modifications as required to avoid exceeding the allowable vibration intensity.

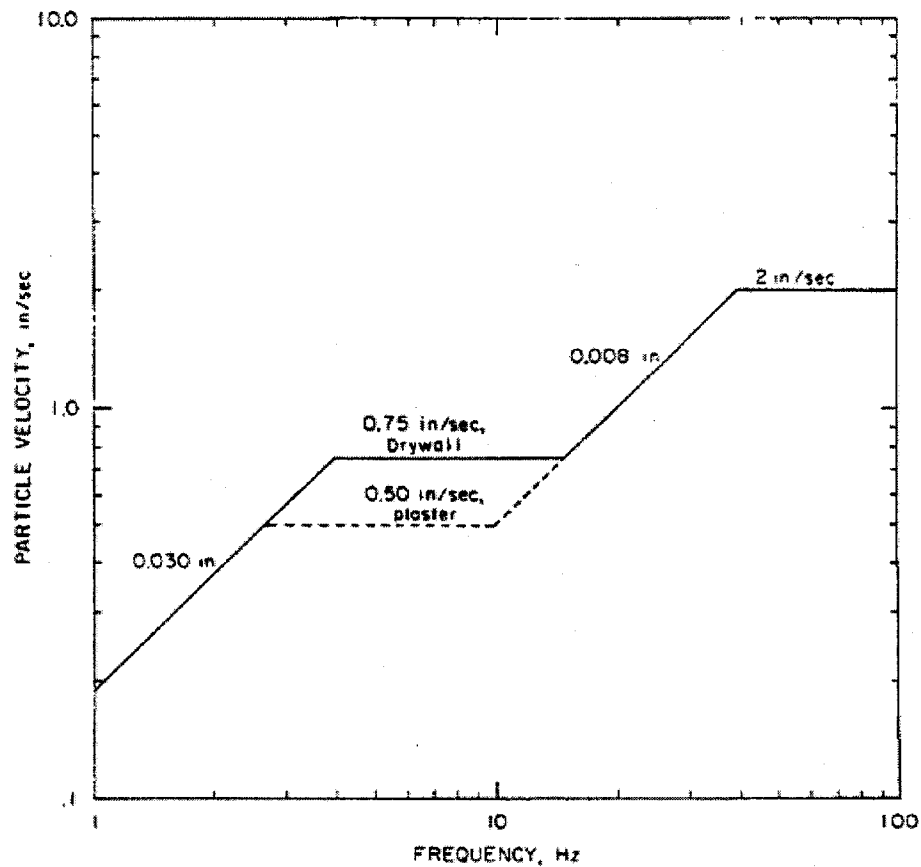


Figure 1 – USBM Vibration Criteria

- C. If the measured velocities exceed the maximum allowable PPVs, stop operations immediately and notify the Commissioner. Propose changes to equipment and procedures to reduce vibrations to allowable levels. Operations shall not resume until approved by the Commissioner.
- D. If the seismographs show any indication of damage or vandalism, the seismographs shall be immediately recalibrated or replaced.
- E. The Contractor shall be in communication with his monitoring firm's personnel during vibration monitoring at all locations to verify the data recorded.
- F. Provide the Commissioner with the results of daily vibration monitoring, one work day after the readings are taken. Upon completion of the construction operations for those locations requiring vibration monitoring, the daily submittals shall be synthesized into a final report.
- G. Additional, specific vibration monitoring requirements for the concrete block marina wall, located south of the work area approximately 40 feet behind the king pile wall being installed, is specified in Section 02457 – Steel Sheet Piles.

## 3.04 MOVEMENT MONITORING

- A. During construction work that may affect the existing structures, monitor the crack gages and position monitoring points within 100 feet of the work area at a minimum frequency of once daily. When no active work is in progress, but the excavation is open, monitor the affected points at a minimum frequency of once per week.
- B. All position monitoring point readings shall consist of both coordinates and elevations. Notify the Commissioner when observed movements from crack gages or position monitoring points reach levels shown in Table 1 below.

Table 1 - Action Plan For Protecting Adjacent Structures

MAXIMUM OBSERVED MOVEMENT	MONITORING LEVEL	NOTIFY	ACTION
50% of Permitted Value	Working	None	None
100% of Permitted Value	Working	Commissioner	Modify Activities
Exceeds Permitted Value	Action	Commissioner	Stop Work & Stabilize Foundations

- C. Reference all readings to one benchmark. Periodically check remote benchmarks to confirm that reference benchmark has not moved
- D. Survey the coordinates and elevations to a precision of  $\pm 0.005$  foot.
- E. Submit readings as specified. Keep all survey records and make available to the Commissioner upon request.

-END OF SECTION-

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

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**Section 01451**  
**CONTRACTOR'S QUALITY CONTROL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Experience and qualifications of supply and service companies
- B. Imperfect work, equipment or materials
- C. Welding and welding inspection
- D. Inspection and testing of concrete
- E. Leakage tests
- F. Contractor's Surveyor
- G. Field Measurements

**1.02 EXPERIENCE AND QUALIFICATIONS OF SUPPLY AND SERVICE COMPANIES**

- A. The General Conditions require the Contractor to submit certain data to the Commissioner for approval. In addition to these requirements, and within thirty (30) days (unless otherwise stated in the progress schedule) after the date upon which the Contractor is notified to Commence Work, but prior to his entering into any supply or service subcontracts, he shall submit the following information:
  - 1. Contract number, supplies or services to be provided and a general description of the proposed item(s), such as trade name, type, etc.
  - 2. The name and address of the manufacturer or service company and the location of the plant at which supplies will be manufactured and tested as required, or at which the services will be performed.
  - 3. Experimental and test data required to support the claimed performance of the supplies.
  - 4. The approximate dates of the manufacturing period.
  - 5. A description of the testing plant, including the hydraulic, electrical and other facilities, in sufficient detail to show that the plant is adequately equipped for making the tests, if such testing is required.

6. Any additional information that the Commissioner may deem necessary in order to determine the ability of the supply or service company to produce the item as called for by the Specifications.

B. The Contractor shall not enter into any subcontracts for the furnishing of supplies or services until he has received, in writing, the Commissioner's approval.

#### 1.03 IMPERFECT WORK, EQUIPMENT OR MATERIALS

A. Any defective or imperfect work, equipment, or materials furnished by the Contractor which is discovered before the final acceptance of the work, as established by the Certificate of Substantial Completion, or during the subsequent guarantee period, shall be removed immediately even though it may have been overlooked by the Commissioner and estimated for payment. Any equipment or materials condemned or rejected by the Commissioner shall be tagged as such and shall be immediately removed from the site. Satisfactory work or materials shall be substituted for that rejected.

B. The Commissioner may order tests of imperfect or damaged work, equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor, and the nature, tester, extent and supervision of the tests will be as determined by the Commissioner. If the results of the tests indicate that the required functional capability of the work, equipment, or material was not impaired, consistent with the final general appearance of same, the work, equipment or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work, equipment or materials has been impaired, then such work, equipment or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment or material in lieu of performing the tests.

#### 1.04 WELDING AND WELDING INSPECTION

A. All welding that is required for the Contract work and is performed within New York City shall be performed by New York City certified welders in accordance with the latest rules of the New York Board of Standards and Appeals (BS&A) and the current provisions of the New York City Construction Codes. Additional certification requirements are as follows:

1. Certification for Welding - For all field and shop welding, the following welding qualification provisions shall apply:

a. Prior to performing any welding, the Contractor must submit for the Commissioner's approval the following certifications: Welding Procedure Specification (WPS), Procedure Qualification Record (PQR), and Welder or Welding Operator Qualification Tests (WOQ). These specifications and qualifications shall be in accordance with Section IX

of the latest edition of the ASME Code, hereafter called the Code. Only certification received within the last three years will be considered for approval.

- b. If existing certification is not approved or not submitted, then the welders/welding shop must be qualified in accordance with the above procedures and tests, as administered by an inspection agency approved by the Commissioner. All the costs associated with the required tests for certification and retests, if any, shall be borne by the Contractor. The City of New York shall be given a notice of not less than five business days prior to such tests and may elect to witness any or all of these tests.
  - c. For welding of carbon steel, in lieu of the above, the Contractor may submit for the Commissioner's approval the following certification: Welding Procedure Specifications and Qualifications in accordance with the latest edition of ANSI/AWS Specification, D-1.1 Structural Welding Code - Steel. Only certification received within the last three years will be considered for approval. If the certification is not approved, the above qualification requirements must be met.
  - d. Any deviation from the requirements stated above shall not be permitted without a written waiver from the Commissioner.
2. Welding Inspection - Welding inspection for welding in New York City shall, in general, be in accordance with the latest rules of the New York City Building Code and the Bureau of Standards and Appeals.
- a. Additionally, all shop and field welds shall be inspected as follows, unless otherwise specified elsewhere.
  - b. All stainless steel welds shall be inspected and approved by means of Liquid Penetrant Examination (PT) in accordance with Appendix 8 of Section VIII, Division 1 of the Code. Any welds failing the inspection shall be made good and reinspected by PT.
  - c. All carbon steel welds not subject to radiographic or visual inspection, and all full-penetration field welds for interior carbon steel piping, shall be inspected and approved by means of Magnetic Particle Examination (MT) in accordance with Appendix 6 of Section VII, Division 1, of the Code. Any welds failing the inspection shall be made good and reinspected by MT.
  - d. On full penetration welds not subject to radiographic inspection, both the root pass and the final weldment shall be inspected by means of MT or PT as applicable.



- e. Radiographic Examination (RT) is required on all full penetration welds for pressure vessels or vessels using pressure vessel grade steel in their construction and structural steel. RT of pressure vessel welds shall be performed in accordance with ASME Pressure Vessel Code, Section VIII, Division 1, Paragraph UW-5.1. RT of structural welds shall be performed in accordance with the New York City Building Code.
- f. Unless otherwise approved, inspection of welds shall be conducted by an inspection agency approved by the City of New York and such costs shall be included in the lump sum price bid for Contract Item 1.
- g. The City of New York may elect to witness any or all of the welding inspection. A notice of not less than five business days shall be given to the Commissioner prior to any welding and inspection of those items specifically designated by the Commissioner.

#### 1.05 INSPECTION AND TESTING OF CONCRETE

- A. All work shall be in accordance with the requirements of Section 03300 - Cast-in-Place Concrete.

#### 1.06 LEAKAGE TESTS

- A. All new pipelines and appurtenant structures and all new liquid containing structures shall be field tested for leakage after installation in accordance with the requirements contained in Section 02505 - Leakage Tests.
- B. No direct or separate payment will be made for leakage tests. The costs shall be included in the prices bid for the respective pipelines and structures.

#### 1.07 CONTRACTOR'S SURVEYOR

- A. The Contractor shall retain the services of a Licensed Land Surveyor, registered in the State of New York, to perform survey work including but not limited to establishing line and grade, in advance of the construction; and to perform other surveying services for the work included under the Contract. The surveyor to be retained by the Contractor shall not be the same surveyor engaged by the Commissioner. The surveyor shall be subject to the approval of the City of New York. Survey drawings shall be submitted to the Commissioner for approval.
- B. The Contractor shall erect, install and maintain survey platforms, targets, benchmarks and similar facilities to be used by the Commissioner in the performance of his inspection services; shall perform all survey work required before, during and after construction and shall comply with the requirements specified under the General Conditions.

- C. The cost of the Contractor's Surveyor Work specified under this Section shall be included in the lump sum price bid for Contract Item 1.

1.08 FIELD MEASUREMENTS

- A. The Contractor shall take all necessary measurements in the field to determine the exact dimensions for all work and verify all pertinent data and dimensions shown on the Contract Drawings.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01452**  
**MOCK-UP REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes, but is not limited to, the following:
  - 1. Composite, or multi-material mock-ups, as indicated on the Drawings.
  - 2. General requirements for mock-ups required by individual specification sections.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02780 – Concrete Pavers
- B. Section 03300 – Cast-in-place Concrete
- C. Section 03410 - Plant Precast Architectural Concrete
- D. Section 03350 - Concrete Finishes
- E. Section 04201 - Unit Masonry
- F. Section 07410 - Metal Wall Panels
- G. Section 07610 - Sheet Metal Roofing
- H. Section 07620 - Sheet Metal Flashing and Trim
- I. Section 07920 - Exterior Joint Sealants
- J. Section 08630 - Translucent Insulating Panels
- K. Section 11010 - Fall Restraint System

**1.03 DEFINITIONS**

- A. Mockups: Full-size, physical assemblies that are constructed on-site or at an approved off site location. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- B. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

**1.04 REQUIREMENTS**

- A. Mock-Ups: Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. After approval of all applicable submissions, build mockups in location and of size indicated or, if not indicated, as directed by Commissioner.

2. Notify Commissioner seven (7) days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Commissioner's written approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven (7) days for initial review and each re-review of each mockup.
  5. Protect and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed by Commissioner, unless otherwise indicated.
- B. Composite Mock-Ups: Representative components of Composite Mockups shown on the Drawings are listed below:
1. Typical Building Corner (Dwg. A590/D3)
  2. Snow guard
  3. Fall restraint
  4. Gutter with typical drain
  5. Zinc roofing system - all layers down to steel deck (including seams and all attachments)
  6. Zinc fascia, both front and side
  7. Zinc soffit
  8. Translucent panel system, including corner, joint, head and sill trim
  9. Metal panel system, including Top and bottom trim strips, and welded corner pieces
  10. Precast panel system, including typical attachments, reveals, and corner chamfer
  11. Cast-in-place concrete base
  12. All necessary flashing and sealants for the above materials, systems, and interfaces

13. Engineered support system which uses attachments per drawings and specifications and which is capable of supporting and maintaining the mock-up under design field conditions
14. Include Factory Authorized Service Representative Inspection of mock-ups per Article 1.07 for the following:
  - a. Sheet Metal Roofing.
  - b. Translucent Insulating Panels.
  - c. Metal Wall Panels.

C. Roof / Monitor Intersection (Dwg.A-590 / B1)

1. Zinc roofing system - all layers down to steel deck, including seams and all attachments. Straight and curved roofs and vertical siding are required.
2. Zinc fascia, both front and side
3. Zinc soffit
4. Translucent panel system, including corner, joint, head, jamb and sill trim
5. All necessary flashing and sealants for the above materials, systems, and interfaces
6. Engineered support system which uses attachments per drawings and specifications and which is capable of supporting and maintaining the mock-up under design field conditions
7. Include Factory Authorized Service Representative Inspection of mock-ups per Article 1.07 for the following:
  - a. Sheet Metal Roofing
  - b. Translucent Insulating Panels

D. Roof/Gable End Wall (Dwg. A-590 / D2)

1. Zinc roofing system - all layers down to steel deck, including seams and all attachments. Both straight and curved roofs are required.
2. Zinc fascia, both front and side
3. Zinc Soffit
4. Translucent panel system, including corner, joint, head, jamb and sill trim.

5. All necessary flashing and sealants for the above materials, systems, and interfaces.
6. Engineered support system which uses attachments per drawings and specifications and which is capable of supporting and maintaining the mock-up under design field conditions.
7. Include Factory Authorized Service Representative Inspection of mock-ups per Article 1.07 for the following:
  - a. Sheet Metal Roofing.
  - b. Translucent Insulating Panels.
  - c. Metal Wall Panels.

#### 1.05 SUBMITTALS

- A. Product Data: Refer to respective specification sections for required mock-up submittal requirements.
- B. Shop Drawings: Provide fully detailed shop drawings of each composite mockup showing location of the mockup on site, materials and construction, and engineered drawings of the proposed supporting structure.
- C. Plan for protecting all mockups for the duration of construction.
- D. Samples: Refer to respective specification sections for required mock-up sample submittal requirements.

#### 1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications for Mockups: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
  1. Where mock-up components are comprised of the work of various trades and/or specification sections, construct mockups using the firms or individuals responsible for each respective portion of the work.
- C. Manufacturer Qualifications for Mockups: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1. Where mock-up components are comprised of the work of various products and or systems of various manufacturers, construct mockups using the manufacturers responsible for each respective portion of the work.
- D. Fabricator Qualifications for Mockups: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
1. Where mock-up components are comprised of the work of various trades and/or specification sections, construct mockups using the firms or individuals responsible for the fabrication of each respective portion of the work.
- E. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 16.

#### 1.07 QUALITY CONTROL

- A. Owner Responsibilities: Where mock-ups require quality-control services that are indicated as the City of New York's responsibility, the City of New York will engage a qualified testing agency to perform these services.
1. The City of New York will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of mock-up testing and inspecting they are engaged to perform.
  2. Costs for retesting and re-inspecting mock-ups that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Mock-up Tests and inspections not explicitly assigned to the City of New York are Contractor's responsibility.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by the City of New York, unless agreed to in writing by the City of New York.
  2. Testing and inspecting of mock-ups requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  3. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services for Mock-ups: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing to the Commissioner.



- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing mock-ups to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
  - 2. Coordinate sequence of construction to be as anticipated for the actual building.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. General: Provide primary and secondary materials as required to construct the required mock-ups. Refer to each of the respective/individual sections of the Construction Manual for specific materials requirements. Materials employed in the mock-ups shall be identical to those materials/systems specified, and shall represent the materials, construction and assemblies proposed in the finished Work.

## PART 3 EXECUTION

### 3.01 REPAIR AND PROTECTION OF IN PLACE FIELD MOCK-UPS

- A. The following applies to mock-ups that are approved for use in the final installation. On completion of testing and approval of mock-ups in place field mock-ups, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  - 2. Comply with the Contract Document requirements for "Cutting and Patching."
- B. Protect mock-ups from damage.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for mock-up services.
- D. Remove mock-ups that are not to be used in the final work.

3.02 SCHEDULE OF MOCK-UPS FOR TESTING

- A. Provide mock-ups for testing by the City of New York's Testing Agency as indicated in respective specifications.

3.03 MOCK-UPS FOR DESIGN APPROVAL

- A. Provide visual mock-ups for review and approval by the Commissioner as indicated in the respective sections of the Specifications.
- B. Prior to proceeding with the Work, provide composite mock-ups as shown on the Drawings for review and approval.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 01512**  
**TEMPORARY VENTILATION FACILITIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary ventilation facilities.

**PART 2 PRODUCTS**

**2.01 TEMPORARY VENTILATION SYSTEM**

- A. The Contractor shall provide all temporary ventilation for ventilating all structures and building areas, both above and below ground level, for the protection of all work and equipment or for safety of its employees, its subcontractor's employees or the employees of the other Contractors after the building or structure is enclosed.
- B. Ventilating systems may be forced or gravity type and shall be complete with fans, motors, inlets, outlets, ductwork, heaters, controls or any other equipment necessary, all furnished and installed by the Contractor. The following additional requirements shall apply:
  - 1. All temporary ventilation methods shall comply with all Federal, State and City of New York rules and regulations.
  - 2. A building or structure shall be enclosed as specified in Article 1.15 of the General Conditions.
  - 3. Ventilation air shall be heated to those temperatures as specified in Article 1.15 of the General Conditions. Where dehumidification is required to prevent mildew or moisture forming on equipment, work or structures in areas being ventilated, it shall be provided by the Contractor.
- C. Temporary ventilation equipment shall be located so as not to interfere with the operation of the new construction work. Protective devices shall be provided for the protection of the personnel.

**PART 3 EXECUTION**

**3.01 OPERATION AND MAINTENANCE**

- A. During the period in which temporary heat in an enclosed building is being furnished and maintained, the Contractor shall provide ventilation for the proper operation of the system and execution of the work.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01513**  
**TEMPORARY POWER FACILITIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Under this section, the Contractor shall provide the following services:
1. Furnish, install, connect, operate and maintain the construction power system and all appurtenances required for the Structures and Equipment, HVAC, Plumbing and Electrical Contracts.
  2. Make arrangements with Con Edison immediately after notice to commence work to furnish the service supplies required for construction light and power.
  3. Provide all material and labor to distribute power from a Con Edison service entry point for electrical power service to the construction site and to the Resident Engineer's Field Office. The service shall be extended by the Contractor and distributed as 120/208V, 3-phase, 4-wire service. The Contractor shall furnish, install, connect, and maintain all circuit breakers, poles, power cables, metering center, fuses, panelboards, wiring, and accessories as specified herein and as required by Con Edison.
  4. Furnish material and labor for the maintenance of the construction light and power for the duration of the Contract work.
  5. Provide temporary lighting as described in the General Conditions.
- B. Contractor shall provide his own temporary electrical system from the service point and pay for his own energy usage.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16020 – Temporary Electrical System

**1.03 GENERAL REQUIREMENTS**

- A. The temporary light and power facilities shall be provided, energized, maintained and de-energized in accordance with Section 16020 – Temporary Electrical System and as specified herein.
- B. The Contractor shall provide an electrical service point to the Resident Engineer's Field Office.

## 1.04 SERVICE PERIOD

- A. Temporary power shall be furnished 24 hours per day, 7 days per week for the duration of the Work and shall conform to Section 16020 – Temporary Electrical System.

## PART 2 PRODUCTS

## 2.01 PORTABLE GENERATOR

- A. The Contractor shall provide a portable on-site power generator for his use in the event of power outages. The generator shall be a 250 kW, 0.8 power factor, 208/120 V, 3-phase, 4-wire generator. The Contractor shall obtain any necessary approvals for use of the generator from Con Edison.

## 2.02 TEMPORARY HEATING SYSTEM FEEDER

- A. The Contractor shall furnish, install, connect and maintain all electrical connections required for the temporary heating system as described in the General Conditions.

## PART 3 EXECUTION

## 3.01 OPERATION AND MAINTENANCE

- A. The Contractor shall provide all material and labor to install, maintain, energize and de-energize the light and power system.
- B. The Contractor shall have one electrician available 24 hours per day for incidental modifications as directed by the Commissioner and to maintain the electrical equipment and power distribution systems at the site for the duration of the Contract.
- C. The Contractor shall remove all portions of the temporary light and power system when so directed by the Commissioner.

-END OF SECTION-

**Section 01520**  
**TEMPORARY CONSTRUCTION FACILITIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor's Field Office
- B. Land for Contractor's Use

**1.02 CONTRACTOR'S FIELD OFFICE**

- A. Contractor shall furnish and maintain a field office in accordance with the General Conditions. Field Office shall be located at the site within the space shown on the Contract Drawings. Off-street parking shall be provided by the Contractor for its field office.
- B. Contractors' field offices shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Commissioner, require exterior painting or maintenance shall be repaired or replaced at the Commissioner's direction.

**1.03 LAND FOR CONTRACTOR'S USE**

- A. Contractor shall confine its construction activities to City of New York-owned property and to the actual area where he is performing work within the Limits of Construction as shown on the Contract Drawings. Personal vehicles of the Contractor's employees will not be permitted on the Site.
- B. The available area must be shared with the other Contractors. Should the Contractor require additional space, he shall provide the space off-site and all such costs and arrangements shall be at its expense.
- C. The City of New York reserves the option to require the Contractor to vacate its assigned areas within sixty (60) days after notice by the City of New York. No additional compensation or extension of contract time will be allowed for any such relocation.
- D. Following the completion of the Contract or as indicated on the Contract Documents or directed by the Commissioner, the Contractor shall remove its facilities, shanties, materials, equipment, etc., from the allocated site and restore the site to its original condition, satisfactory to the Commissioner.



PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01550**  
**VEHICULAR ACCESS AND PARKING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Maintenance of traffic
- B. Site Access
- C. Truck routes
- D. Construction staff parking area

**1.02 MAINTENANCE OF TRAFFIC**

- A. During working hours, the Contractor shall be responsible for maintenance and control of traffic in and out of the site at all points of vehicular ingress and egress and shall provide flagmen to warn vehicles on the City of New York streets of vehicles approaching from the site. Flagmen shall be properly attired and equipped according to the regulations of the City of New York. A minimum of one lane of traffic in each direction shall be maintained on City of New York streets at all times.
- B. Modifications to existing streets and traffic patterns shall be approved by and in accordance with the requirements of the Office of Construction Coordination (OCC). Each Contractor shall be responsible for obtaining and paying for this approval whenever his construction operations require modifications to the existing streets or traffic patterns. Traffic safety devices shall be placed as per the Manual of Uniform Traffic Control Devices (MUTCD).
- C. When equipment delivered under this Contract is transported as an "oversized load" the responsible Contractor shall maintain traffic in accordance with the requirements of the various City of New York agencies having jurisdiction.
- D. During the progress of the work, the Contractor shall provide all temporary construction roads and walkways as required, and shall make ample provisions to prevent interference with the continued maintenance of vehicular traffic on roadways and shall indemnify and save harmless the City of New York and the Commissioner from any expense whatsoever due to his operations over said roadways. Any roadways damaged by the Contractor or his subcontractors or materialmen shall be restored to their original condition upon notification by the Commissioner that such repairs are required and such restoration of the roadway shall be at the responsible Contractor's expense. Temporary construction roads and walkways shall be removed, at the Contractor's expense, prior to acceptance of the Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 SITE ACCESS

- A. The Contractor shall provide and maintain the temporary access to the site of the work during the life of this Contract.
- B. The Contractor shall provide each of his employees an identification badge which shall display the employee's name, photograph, and trade, the Contractor's name and the Contract. Every employee shall wear this identification badge, prominently displayed on his person to obtain access to the site and at all times while present on the site.

3.02 TRUCK ROUTES

- A. During the progress of construction, trucks entering or leaving the site shall utilize only NYCDOT-designated and DDC-directed or -approved truck routes. The Contractor shall assure that its crew members, and its subcontractors and materialmen and their crew members are fully advised of the designated and directed or approved routes.
- B. NYCDOT truck routes are identified on maps available from the NYCDOT. Copies of these maps can be obtained from the New York City Department of Transportation (NYCDOT) Office of Planning and Urban Mobility, Room 928, 40 Worth Street, New York, NY or from the NYCDOT website ([www.nyc.gov/html/dot/html/motorist/trucks.shtml](http://www.nyc.gov/html/dot/html/motorist/trucks.shtml)).

3.03 CONSTRUCTION STAFF PARKING AREA

- A. The parking area identified on the Contract Drawings is limited in extent. The area shall be utilized solely by the Construction Management staff and visitors to the Construction Management Office.
- B. The Contractor shall take appropriate actions to ensure that no personal vehicles of its employees, or employees of its subcontractors or materialmen will be permitted on the work site.

-END OF SECTION-

**Section 01560**  
**TEMPORARY BARRIERS AND ENCLOSURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Barricades
- B. Fencing
- C. Protection of work, personnel and materials
- D. Tree and plant protection

**1.02 RELATED SPECIFICATIONS**

- A. Section 01570 - Temporary Controls
- B. Section 02821 - Metal Fence

**1.03 BARRICADES****A. Roads, Parking Areas and Sidewalks**

1. Contractor shall provide, erect and maintain as necessary for his work, strong and suitable barricades, danger signs and warning lights along all roads, parking areas and sidewalks, accessible to the public or City of New York personnel.
2. All barricades and obstructions shall be illuminated at night and all lights for this purpose shall be kept burning from sunset to sunrise.
3. Sufficient barricades shall be erected to keep vehicles from being driven on or into work under construction.

**B. Excavations**

1. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property.
2. Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required.

3. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Commissioner. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the City of New York may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.
  4. The Contractor shall take precautions to prevent injury to the public or City of New York personnel due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public or City of New York personnel shall be well lighted from sunset to sunrise.
- C. Contractor's responsibility for the maintenance of barricades, signs and lights shall continue until the Project is accepted by the City of New York. Contractor shall provide and maintain such other warning signs and barricades in other areas and around their respective work as may be required for the safety of all those employed in the work, plant operating personnel, or those visiting the site.

#### 1.04 FENCING

##### A. Construction Fencing

1. At the start of the work, the Structures and Equipment Contractor shall provide and erect construction fencing to completely enclose the construction sites of this Project in accordance with the Contract Documents. Any damage to the construction fencing shall be immediately repaired by the Contractor to the satisfaction of the Commissioner.
2. Chain link fence shall be 10 feet high unless shown otherwise on the Contract Drawings and shall conform to the requirements of Section 02821 – Metal Fence. The Contractor shall also provide the size and number of gates for ingress and egress in accordance with the Contract Documents.

##### B. Safety Fencing

1. Contractor shall provide and erect, when required or directed by the Commissioner, temporary project safety fencing at the work site.
2. The safety fencing shall be a high visibility, orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers.

- C. Fencing shall be maintained by the Contractors during the life of the Contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

## 1.05 PROTECTION OF WORK, PERSONNEL AND MATERIALS

- A. Until permanent walls, railings, stairs, hatches, etc., are in place, the Structures and Equipment Contractor shall be responsible for the installation and maintenance of temporary barricades and temporary railings around openings, stairwells, on temporary or permanent stairs, around the perimeter of elevated floors, landings, permanent ramps, etc. The installation shall be in accordance with the requirements of OSHA and the codes and regulations of authorities having jurisdiction.
- B. During the progress of the work and up to the date of final payment, Contractor shall be solely responsible for the care and protection of all work, personnel, and materials covered by the Contract.
- C. In order to prevent damage, injury or loss, actions taken by Contractor shall include, but not be limited to, the following:
  - 1. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not interfere with the progress of the work or the work of any other Contractor or utility service company.
  - 2. Provide suitable storage facilities for all materials which are subject to injury by exposure to weather, theft or breakage.
  - 3. Place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.
  - 4. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a safe, orderly and workmanlike appearance.
- D. Contractor shall protect the existing work and material from damage by his workmen and shall be responsible for repairing any such damage at no additional cost to the City of New York.

## 1.06 TREE AND PLANT PROTECTION

- A. Contractor shall protect trees, shrubbery and other natural features from being cut, trimmed or injured in his area of work. Trees adjacent to the site of work shall be protected and temporary supports provided for long branches. Stored materials and equipment shall be in cleared spaces, away from all trees and shrubs, and confined to areas as directed by the Commissioner.
- B. Temporary fences or barricades shall be installed to protect trees and plants in areas subject to traffic.
- C. Within the limits of the work, water trees and plants that are to remain, in order to maintain their health during construction operations.

- D. Cover all exposed roots temporarily with burlap that shall be kept continuously wet. Exposed roots shall be covered with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff or noxious materials in solution.
- E. If branches or trunks are damaged, prune branches immediately and protect the cut or damaged areas with emulsified asphalt compounded specifically for horticultural use in a manner approved by the Commissioner.
- F. All damaged trees and plants that die or suffer permanent injury shall be removed when ordered by the Commissioner and replaced by a specimen of equal or better quality at the Contractor's expense.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01561**  
**SITE SECURITY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Work site security requirements.

**1.02 SECURITY GUARD AND FIRE GUARDS**

- A. Security guards and fire guards will be required as described in the General Conditions.

**1.03 ADDITIONAL SECURITY**

- A. Contractor shall provide his own site security as he deems necessary. The additional cost of such approved protection shall be paid by the Contractor. Any security services furnished by the Contractor must meet the requirements of the New York State Security Guard Act of 1992.
- B. Nothing contained herein shall diminish in any way the responsibility of the Contractor for safeguarding and protecting his own work, materials, tools and equipment.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**-END OF SECTION-**



NO TEXT ON THIS PAGE

**Section 01570  
TEMPORARY CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Prohibited construction procedures
- B. Pollution Control
- C. Dust, soil erosion and sedimentation control
- D. Noise Control

**1.02 RELATED SPECIFICATIONS**

- A. Section 02371 - Dust, Soil Erosion and Sedimentation Control

**1.03 GENERAL REQUIREMENTS**

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to assure adequate environmental protection including implementation of all control measures as directed by the Commissioner and specified herein.
- B. Contractor shall comply with all applicable Federal, State and Local laws and regulations concerning environmental protection, restoration and erosion and sediment control.

**1.04 SUBMITTALS**

- A. Submit Environmental Plan describing proposed methods, schedules and materials for implementing the environmental protection requirements.

**1.05 PROHIBITED CONSTRUCTION PROCEDURES**

- A. The following construction procedures are prohibited:
  - 1. Dumping or wasting of spoil material into any stream corridor, any surface waters or at unspecified locations adjacent to the work area or at locations not approved by the Commissioner.
  - 2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridor or surface waters.
  - 3. Dumping of silt-laden water directly into any stream corridor or surface waters without provision for treatment as noted herein.

4. Damaging vegetation adjacent to or outside of access roads or limited rights-of-way for the work. All construction operations must be confined within the Contractor's work limits as shown and/or specified.
5. Disposal of trees, bush and other debris into any stream corridor, any wetlands or at unspecified locations.
6. Open burning of materials.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 POLLUTION CONTROL

- A. Contractor shall provide the methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
- B. Equipment and personnel shall be provided by Contractor to perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids for off-site disposal.
- C. Special measures shall be taken by Contractor to prevent harmful substances from entering public waters, and to prevent disposal of wastes, effluents, chemicals, or other such substances to adjacent waterways or to sanitary or storm sewers.
- D. Contractors shall provide systems for control of atmospheric pollutants to prevent toxic concentrations of chemicals and to prevent harmful dispersal of pollutants into the atmosphere.
- E. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of the EPA and other recognized certifying agencies. Use of all such chemicals and disposal of residues shall be in strict conformance with regulatory requirements.
- F. All Contractors' equipment used during construction shall conform to all current federal, state and local laws and regulations.

### 3.02 DUST, SOIL EROSION AND SEDIMENTATION CONTROL

- A. All Contractors shall comply with the requirements of Section 02371 - Dust, Soil Erosion and Sedimentation Control.

## 3.03 NOISE CONTROL

- A. Noise control during construction activities shall be performed in accordance with §24-219 of the New York City Noise Code.
1. Other than impulsive sound, sound from construction devices and exhausts should not exceed 85 dBA at 50 feet at a point outside the property line or in the public right-of-way. If the aggregate sound levels from a construction site exceed the allowable construction decibel level limits, compliance with the specific equipment decibel limits above does validate site compliance.
  2. Impulsive sound should not exceed 15 dBA or more above ambient at a receiving property or at a distance of 15 feet or more in a public right-of-way. Impulsive sound should be measured with the noise meter set to a "fast" response. Ambient sound should be measured with the noise meter set to a "slow" response.
  3. Sound from the transport or movement of containers and construction material shall not exceed the following noise limits:  
  
7 dBA above ambient between 10pm and 7am;  
10 dBA above ambient between 7am and 10pm; and
  4. Pneumatic discharge muffler must have a dynamic insertion loss of 5 dBA of the sound released from the air discharge of the paving breaker. Maximum sound levels emanating from the paving breaker should not exceed 95 dBA at 1 meter (75 dBA at 50 feet).
- B. Contractor shall complete a Construction Noise Mitigation Plan (CNMP) as specified in the New York City Noise Code.
1. Contractor may be required to file the CNMP with the Department of Environmental Protection (DEP) if requested, although typically not.
  2. Contractor shall provide as part of CNMP noise mitigation strategies for construction equipment such as pile drivers, bulldozers, cranes, derricks, air compressors, generators, tunneling machines, etc at construction sites. Noise mitigation strategies may include:
    - a. Site perimeter fences with acoustical blankets;
    - b. Portable barriers with acoustical blankets;
    - c. Acoustical blankets; and
    - d. Exhaust muffler testing and certification
  3. Contractor shall provide the CNMP prior to construction. For emergency activities, the CNMP must be adopted within 3 days after the start of activities.

4. Contractor shall keep CNMP on-site and available for inspection.
  5. Contractor shall amend CNMP to accommodate changes/additions to construction activities and equipment.
- C. Contractor's vehicles and equipment shall be operated and maintained so as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest regulatory standards and in no case will noise levels be permitted which interfere with the work of the on-site personnel.
1. All construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler.
  2. Air-powered equipment shall be fitted with pneumatic exhaust silencers.

#### 3.04 NOTIFICATION OF NON-COMPLIANCE

- A. The Commissioner will notify the Contractor in writing of any non-compliance with the provisions of this Section and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose.
1. If the Contractor fails or refuses to comply promptly, an order stopping all or part of the work may be issued by the City of New York until satisfactory corrective action has been taken.
  2. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor, unless it is later determined that the Contractor was in compliance with the provisions of this Section.
- B. Compliance with the provisions of this Section by subcontractors shall be the responsibility of the Contractor.

-END OF SECTION-

**Section 01631**  
**EQUIVALENT MATERIALS AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for substitution of materials equivalent to those specified in the Contract Documents.

**1.02 GENERAL REQUIREMENTS FOR SUBSTITUTION**

- A. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a particular manufacturer, fabricator, supplier or distributor, the naming of the item is intended to establish the type, function and quality required, and an equivalent item may be submitted for approval.
- B. Where the Contractor proposes to supply a substitution for a particular manufacturer, equipment or material named in the Specification, it shall conform to the General Conditions and the requirements of this section.
- C. Requests for review of the substitute items of material and equipment will not be accepted by the Commissioner from anyone other than the Contractor. If the Contractor wishes to furnish or use a substitute item of material or equipment, the Contractor shall make written application to the Engineer for acceptance thereof, certifying that the proposed substitute will satisfactorily perform the functions and achieve the results called for by the Contract Documents, be similar and of equal substance to that specified and be suited to the same use as that specified.
  - 1. The application shall state the evaluation and acceptance of the proposed substitute will not prejudice the Contractor's timely achievement of Substantial Completion, whether or not acceptance of the substitute for use in the Work will require a change in the Contract Documents to adapt the design to the substitute and whether or not the substitute is subject to payment of any license fee or royalty.
  - 2. All variations of the proposed substitute from that specified shall be identified in the application. Available maintenance, repair and replacement service shall be indicated. The application shall also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and impact on other contractors affected by the change, all of which shall be considered by the Commissioner in evaluating the proposed substitute.
  - 3. Commissioner may require the Contractor to furnish at the Contractor's expense additional testing and data concerning the proposed substitute. The Commissioner will be allowed a reasonable time within which to evaluate the

proposed substitute. The Commissioner will be the judge of acceptability and no substitute will be ordered or installed without the Engineer's prior written acceptance.

#### 1.03 CHANGES RESULTING FROM SUBSTITUTION

- A. The Contract Documents were prepared to accommodate the equipment furnished by the manufacturers named and all motor horsepower, connecting pipe sizes, equipment dimensions, etc., shown are based on the best information available at the time of design.
- B. If the substitute equipment to be furnished is different in dimensions, horsepower requirements, pipe connection sizes or other material characteristic from that provided for on the Contract Documents, and the difference in the equipment dimensions, horsepower requirements, pipe connection sizes, or other material characteristic is not the result of changes in design conditions or concept ordered by the Commissioner, then the Contractor shall be responsible for the furnishing of all properly sized connecting piping, motor starters, motor control centers, and electrical wiring and connections, and all other work required to properly install the equipment in complete operating condition.
- C. The cost of all such revisions shall be considered to be included in the total price bid for the Contract. The Contractor shall pay all costs for changes required to related Contracts resulting from the substitution.

#### 1.04 SPECIAL PERFORMANCE GUARANTEE

- A. The Commissioner may require the Contractor to furnish, at the Contractor's expense, a special performance guarantee or other security acceptable to the City of New York.

#### 1.05 COMMISSIONER SHALL BE THE JUDGE

- A. In all cases, the Commissioner shall be the judge as to whether a proposed substitution is to be approved. The Contractor shall abide by the Commissioner's decision when proposed substitute items are judged to be unacceptable and shall in such instances furnish the item specified or indicated. No substitute items shall be used in the work without written approval of the Commissioner.
- B. The Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Commissioner in considering a substitution proposed by the Contractor or by reason of the failure of the Commissioner to approve a substitution proposed by the Contractor.
- C. Acceptance of any proposed substitution shall in no way release the Contractor from any of the provisions of the Contract Documents.

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

**-END OF SECTION-**



**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

**NO TEXT ON THIS PAGE**

**Section 01651**

**TRANSPORTATION AND HANDLING OF MATERIALS AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Delivery and handling of products
- B. Inspection of items
- C. Supporting heavy loads

**1.02 GENERAL REQUIREMENTS**

- A. Contractor shall make all arrangements for transportation, delivery and handling of equipment and materials required for prosecution and completion of the work.
- B. Equipment shall not be delivered to the site until it can be moved directly to its concrete foundation pad and placed thereon, or to the area where it will be utilized.
- C. If necessary to move stored materials and equipment during construction, the Contractor shall move materials and equipment without any additional compensation.

**1.03 DELIVERY OF PRODUCTS**

- A. The Contractor shall arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.
- B. Coordinate deliveries to avoid conflict with work and conditions at the site and to accommodate the following:
  - 1. Work of other Contractors
  - 2. Limitations of storage space
  - 3. Availability of equipment and personnel for handling products
- C. Products shall not be delivered to the project site until related Shop Drawings, including the manufacturer's recommended storage instructions, have been approved by the Commissioner.
- D. Products shall not be delivered to the site until required storage facilities have been provided.

- E. Products shall be delivered to site in manufacturer's original, unopened, labeled containers. Commissioner shall be informed of delivery of all equipment to be incorporated in the work.
- F. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.
- G. Immediately on delivery, inspect shipments to assure:
  - 1. Product complies with requirements of Contract Documents and approved submittals.
  - 2. Quantities are correct
  - 3. Containers and packages are intact; labels are legible.
  - 4. Products are properly protected and undamaged.

#### 1.04 HANDLING OF PRODUCTS

- A. The Contractor shall provide equipment and personnel necessary to handle products by methods to prevent soiling or damage to products or packaging.
- B. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.
- C. Transport and handle products in accordance with manufacturer's instructions.
- D. Handle products by methods to prevent bending or overstressing.
- E. Lift heavy components only at designated lifting points.
- F. Materials and equipment shall at all times be handled in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

#### 1.05 INSPECTION OF ITEMS

- A. The Contractor shall inspect all items, including all boxes, crates and packages, containing equipment and materials for damage that may have occurred during shipment prior to its removal from the truck or other conveyance. Any damage shall be reported immediately to the Commissioner.
- B. The Contractor shall then carefully remove the equipment and materials from the truck or trucks on which it is shipped. The equipment and materials shall then be

transported to the place of installation at the job site. The Contractor shall be liable for loss or damage to the equipment and materials that may occur while being unloaded, transported, stored or installed.

- C. All equipment that arrives at the job site during normal working hours shall be unloaded as soon as practicable.

#### 1.06 SUPPORTING HEAVY LOADS

- A. The Contractor shall, in all cases where heavy loads are to be temporarily imposed on existing slabs, assure himself of the slab's load-sustaining ability. Whenever heavy loads are to be stored or temporarily imposed on slabs, the Contractor shall submit to the Commissioner a plan of procedure prepared by a Professional Engineer licensed in the State of New York, indicating a structural analysis of the slabs and methods of distributing loads, and providing auxiliary support so that slabs and beams are not loaded in excess of their design loadings.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01661**  
**PROTECTION OF MATERIALS AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Storage of product
- B. Protection of materials and equipment
- C. Protection of installed equipment

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION**

**3.01 STORAGE OF PRODUCT**

- A. Store products on shelves, in bins, or in neat groups of like items, with seals and labels intact and legible, and in a manner to provide access for maintenance and inspection.
- B. Store loose granular materials on clean, solid, flat surfaces and prevent mixing with foreign matter. Store fabricated products supported above the ground on skids or blocking. Provide surface drainage to prevent erosion and ponding of water.
- C. Cover products subject to discoloration or deterioration with impervious sheet covering, and protect products from soiling and staining.
- D. Store and protect products which are subject to damage by the elements in weathertight, climate controlled enclosures and according to manufacturer's instructions. Maintain temperature, ventilation, and humidity within ranges stated in manufacturer's instructions.
- E. Attach applicable manufacturer's service instructions labeled "STORAGE SERVICE INSTRUCTIONS ENCLOSED" to exterior of each stored product.
- F. Inspect, maintain and service stored products on a regularly scheduled basis, consistent with manufacturer's instructions.
- G. Record inspection, maintenance and services performed and keep log available for review.
- H. If it becomes necessary to remove and relocate materials to avoid impeding the progress of any part of the work of any contractor, the Contractor shall relocate such materials at no additional cost to the City of New York.

### 3.02 PROTECTION OF MATERIALS AND EQUIPMENT

- A. The Contractor shall make every effort to minimize extended storage periods of materials and equipment at the Site by scheduling deliveries to coincide with construction needs.
- B. Storage of any mechanical or electrical equipment out of doors at any time is absolutely prohibited regardless of the protection furnished. Storage of mechanical and electrical equipment within structures at the Site will not be permitted unless the structures are enclosed. A structure shall be considered to be enclosed when it is roofed and has protection of doorways, windows and other opening closures.
- C. All mechanical and electrical equipment shall be coated, wrapped and otherwise protected from snow, rain, drippings of any sort, dust, mud, condensed water vapor, etc., during shipment, storage, and installation and until placed in service.
- D. All storage areas for motors shall be heated. Space heaters shall be supplied in all enclosures being utilized for storage of motors. Motors equipped with space heaters shall be properly wired and the heaters activated while the motors are in storage.
- E. Should storage of mechanical and electrical equipment become necessary before it can be stored at the Site, the Contractor shall provide storage in a weatherproof warehouse.
- F. Materials may be stored out of doors if supported above ground surface on wood runners and protected with approved, effective and durable covers.
- G. All storage and protection of materials and equipment at the Site shall be subject to the approval of the Commissioner.
- H. Prior to installation of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by a long storage period. If such a certification is not given, the equipment shall be judged to be defective, and shall be removed and replaced at the Contractor's expense.

### 3.03 PROTECTION OF INSTALLED EQUIPMENT

- A. The Contractor shall provide protection of installed products, as required, to prevent damage and remove protection devices/facilities, when no longer needed, prior to completion of work.
- B. Projections such as wall corners, jambs, sills and soffits of openings, shall be covered in areas used for traffic and for passage of products in subsequent work.
- C. Equipment for which shop finish paint is required shall be protected in the shop and during transportation and installation to prevent injury and abrasion. Such

equipment shall be scheduled for installation when a building is considered enclosed and as late as possible in the construction schedule. However, maintenance of schedules may require the installation of such equipment in unheated areas and in areas where masonry work, concrete finishing, steel erection, painting, and other work will be in progress.

1. Shop finished work shall be protected during and after installation by waterproof wrappings sealed to prevent condensation on surfaces. Wrappings shall be sufficient to protect surfaces from damage by drippings from masonry and painting work, and additional covering or sheeting shall be provided to protect equipment from damage which might result from work in progress in adjacent areas.
2. Prior to final completion, wrappings and coverings shall be removed, equipment shall be cleaned and all scratches and abrasions shall be refinished.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 01721**  
**PROTECTION AND RESTORATION OF STRUCTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Protection of existing structures and utilities
- B. Underground structures
- C. Surface structures
- D. Notice to utility companies to remove structures
- E. Notice to utility companies to support, protect, temporarily remove and replace structures within limits of work
- F. Restoration of structures and pavements

**1.02 GENERAL REQUIREMENTS**

- A. The Contractor shall execute the Work to prevent damage or injury to existing facilities and adjacent private properties and occupants thereof, which might result from work or other causes.
- B. The Contractor shall erect and maintain barriers, lights, fences, and other required protective devices in accordance with the Contract Documents and the NYC Construction Codes and the requirements of the NYC Department of Transportation.
- C. The Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, injury, loss or vandalism.
- D. The Contractor shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is caused by or on account of any act, omission, neglect or misconduct in the execution of the Work by the Contractor, it shall be restored by the Contractor, at its expense, to a condition equal to that existing before the damage was done. Where necessary to protect the Work or materials from damage, the Contractor shall, at its expense, provide suitable drainage and erect such temporary structures as are necessary to protect the Work or materials from damage. The suspension of the Work or the granting of an extension of time from any cause whatever shall not relieve the Contractor of its responsibility for the Work and materials.

- E. Whenever any notice is required to be given by the City of New York or the Contractor to any adjacent or adjoining landowner or other party before commencement of any Work, such notice shall be given by the Contractor within the time limitations required for such notices.
- F. All structures and appurtenances shall be adequately supported and safeguarded against all damage or injury in performance of work under this Contract. The Contractor will be held responsible for any such damage or injury resulting from its operations and shall repair such damage immediately and to the satisfaction of the Commissioner.
- G. The Contractor shall ascertain the location of underground pipelines, conduits and other subsurface structures in those locations where the operation of its heavy construction equipment might damage such structures. The Contractor shall either avoid such locations or provide the necessary safeguards and repair any damage quickly at its own expense.
- H. The Contractor shall comply promptly with such safety regulations as may be prescribed by the Commissioner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of its employees. In the event of the Contractor's failure to comply, the Commissioner may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Commissioner to direct the correction of unsafe conditions or practices shall not relieve the Contractor of its responsibility hereunder.
- I. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at its own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

#### 1.03 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as electric power and lighting, telephone, cable television, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.
- B. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the work may not be shown and that the locations of those shown are approximate only. It shall be

the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.

- C. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to insure uninterrupted of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at its own expense in a manner approved by the Commissioner and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.
- D. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, the Contractor shall provide such support and protection. All such work shall be performed in a manner satisfactory to the Commissioner and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Commissioner may, at this discretion, have the respective authority provide such support or protection as may be necessary to ensure the safety of such utility, and the costs of such measures shall be paid by the Contractor.
- E. During the progress of the Work, the Contractor shall protect from injury any existing utilities or services within the work area until, if required, they have been re-routed, disconnected or capped off. Protection and re-routing shall conform to standards established by the utilities, agencies and governing codes.

#### 1.04 UNDERGROUND STRUCTURES

- A. Underground structures are defined to include, but not be limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical and signal conduits, tunnels and other existing subsurface work located within or adjacent to the limits of the Work.
- B. All underground structures known to the Commissioner are shown for the assistance of the Contractor in accordance with the best information available, but are not guaranteed to be correct or complete.
- C. The Contractor shall explore ahead of its trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption to the services which such structures provide. If the Contractor damages an underground structure, it shall restore it to original condition at its expense.

- D. Necessary changes in the location of the work may be made by the Commissioner, to avoid unanticipated underground structures.
- E. If the Contractor discovers utility facilities not identified in the Contract Documents or in a position different from that shown in the Contract Documents, it shall immediately notify in writing the Commissioner and the owner of the utility facility.

1.05 SURFACE STRUCTURES

- A. Surface structures are defined as all existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface.
- B. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

1.06 PROTECTION OF UNDERGROUND AND SURFACE STRUCTURES

- A. The Contractor shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be performed carefully and as required by the party owning or controlling such structure. Before proceeding with the Work of sustaining and supporting such structure, the Contractor shall satisfy the Commissioner that the methods and procedures to be used have been approved by the party owning same.
- B. The Contractor shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits of the Work. The Contractor shall be responsible for all damage and expense for direct or indirect injury caused by its Work to any structure. The Contractor shall repair immediately all damage caused by its Work, to the satisfaction of the owner of the damaged structure.
- C. The fact that any structure or facility is not shown on the Drawings shall not relieve the Contractor of his responsibility of protecting and preserving the structure or facility.
- D. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables signs, poles, markers, and curbs which are temporarily removed to facilitate installation of the Work shall be replaced and restored to their original condition at the Contractor's expense.

1.07 RESTORATION OF STRUCTURES AND PAVEMENTS

- A. Restoration of hydrants and hydrant connections and all other City of New York structures shall be in conformity with the requirements of the Contract Documents and the specifications of the respective departments having jurisdiction thereof, Bureau of Water Supply, Bureau of Electrical Control, and Fire Department.
- B. Restoration of pavements shall be made in conformity with the requirements of the NYC Department of Transportation Standard Highway Specifications, latest edition. These specifications may be examined at the Office of the Department of Transportation, Bureau of Highway Operations, 40 Worth Street, New York, New York. The Bidder shall acquaint itself with such requirements before submitting its bid. The Contractor shall give the Department of Highways four weeks written advance notice before proceeding with final restoration of pavements, walks and curbs.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01732**  
**INSTALLATION OF EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete foundations, bases, anchor bolts, recesses, openings, etc.
- B. Installation of equipment
- C. Workmanship
- D. Clearance and Safeguards
- E. Alignment and Leveling
- F. Lubrication
- G. Maintenance of Installed Equipment

**1.02 GENERAL REQUIREMENTS**

- A. Contractor shall have on hand sufficient personnel, proper equipment, and machinery of ample capacity to facilitate the work.
- B. Contractor shall be responsible for locating, aligning and leveling all equipment and shall employ a licensed surveyor to set all lines and levels of equipment to the accuracy required.
- C. Complete manufacturer's installation instructions, including permissible tolerances, shall be furnished in duplicate with each unit of equipment or set of identical units.
- D. All equipment shall be installed in accordance with the approved Working Drawings; inclusive of manufacturer's specifications, drawings and tolerances; under the direct supervision of the required manufacturer's representative. In no instance shall the directions of the manufacturer's representative contravene the Commissioner's direction.
- E. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the drawings unless directed otherwise by the Commissioner during installation.



## PART 2 PRODUCTS

## 2.01 CONCRETE FOUNDATIONS, BASES, ANCHOR BOLTS, RECESSES, OPENINGS, ETC.

- A. All reinforced concrete bases and supports shall be steel reinforced and dowelled to floor slabs. Dowels shall be in place before floor slab concrete is placed where possible.
- B. Anchor bolts penetrating into existing reinforced concrete work shall be drilled in place and shall be of the expansion type and have sufficient length and configuration to resist the imposed loadings when installed in accordance with the Contract Documents and the manufacturer's recommendations, and approved by the Commissioner. Dowels and anchor bolts in existing concrete shall be installed using a bonding agent approved by the Commissioner. All concrete bases for equipment shall be treated with an approved sealer to prevent oil and grease from seeping into the concrete.
- C. Reinforced concrete bases, dowels and anchor bolts into existing and new reinforced concrete work shall be in accordance with the Contract Documents and the manufacturer's recommendations and subject to the approval of the Commissioner.
- D. The Contractor shall make provisions for sleeves, recesses, openings, chases and related items for equipment and materials to be installed where shown, specified or required.

## PART 3 EXECUTION

## 3.01 INSTALLATION OF EQUIPMENT

- A. Supervision by Manufacturers' Representatives: The Contractor shall provide the services of qualified equipment manufacturers' technical representatives who shall adequately supervise the installation and testing of all equipment and instruct the Contractor's personnel and City of New York operating personnel in its maintenance and operation.
  - 1. The manufacturers' representatives shall devote, as a minimum, the full time specified. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.
  - 2. The manufacturers' representatives shall sign in and out in a book kept by the Commissioner on every occasion they are on the Site and shall indicate time of arrival and departure.
- B. Concrete foundations for equipment shall be of approved design and shall be adequate in size, suitable for the equipment erected thereon, properly reinforced,

drained and tied into floor slabs by means of reinforcing bars or dowels. Foundation bolts of ample size and strength shall be provided and properly positioned by means of suitable templates and secured during placement of concrete.

- C. Foundations shall be built and bolts installed in accordance with the manufacturer's certified drawings.
- D. Before mounting equipment on a foundation, the Contractor shall clean the top surface; if necessary, rough it with a star chisel and clean again; and clean out all foundation bolt sleeves. The Contractor shall provide a sufficient number of steel plate shims about 2 inches wide and 4 inches long, and of a varying thickness from 1/8 to 1/2 inch. A combination of these shims shall be placed next to each foundation bolt to bring the bottom of the bedplate or frame about 1/8 inch above the final setting. The equipment shall be lowered by changing the combination of shims. Using brass shim stock of various thicknesses, continue to level the equipment a little at a time and in rotation until it is at the correct elevation in both directions. When the equipment is level, tighten the foundation bolts a little at a time in rotation to make certain the equipment remains level and does not shift on the shims. A preliminary alignment check shall be made before grout is placed.
- E. Equipment shall be set, aligned and assembled in conformance with manufacturer's drawings or instructions. Runout tolerances by dial indicator method of alignment shall be plus or minus 0.002 inches or as directed by the manufacturer, whichever is more stringent.
- F. All blocking, wedges, shims, filling pieces, or other materials required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed, except steel shims, which may be left in place with the approval of the Commissioner. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.
- G. Each piece of equipment or supporting base, bearing on concrete foundations, shall be bedded in grout. The Contractor shall provide a minimum of 1-1/2 inch thick grouting under the entire baseplate supporting each pump, motor drive unit and other equipment. Grout bed shall be a non-shrink grout, "Euco-N-S" by the Euclid Chemical Company or "Masterflow 713" by Master Builders, or approved equal.
- H. When motors are shipped separately from driven equipment, the motors shall be received, stored, meggered once a month, and the reports submitted to the Commissioner for information. After driven equipment is set, the motors shall be set, mounted, shimmed, millrighted, coupled and connected complete.
- I. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal welding and to prevent "flat-spotting" of bearings.

- J. Anchor and expansion bolts shall be furnished by the Contractor, as specified and required. Expansion bolts shall only be used where permitted by the Commissioner. Anchor and expansion bolts shall be of Type 316-stainless steel unless otherwise specified. Anchorage items shall conform to the applicable requirements of the Contract Documents. The nuts for anchor bolts shall be carbon steel.
- K. At threaded connections a molybdenum disulphide anti-seize compound shall be applied to all threads in mechanical connections such as bolts, studs, cap screws, tubing, etc., unless otherwise indicated.

### 3.02 WORKMANSHIP

- A. The following erection Specifications are not intended to cover all instructions, but only some of the important practices. In all cases, only the best methods known to the trades shall be employed.
- B. Only those mechanics skilled in the handling, setting, alignment, leveling and adjustment of the type of equipment supplied shall be employed in the work.
- C. An oil bath heater shall always be used to expand couplings, gears, etc. They shall not be forced or driven on equipment shafts, nor shall they be subjected to an open flame or torch.
- D. Wedging will not be permitted. Only the least number of flat shims are to be used in leveling equipment (shims are to be clean and free of slag). All shims, filling pieces, keys packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.
- E. Proper tools shall be used in the assembly of equipment and materials to prevent marring the surface of shafts, nuts or other parts.
- F. Connections requiring gaskets shall be tightened evenly all around to ensure uniform stress over the entire gasket area.
- G. No equipment and materials shall be altered or repaired, and no burning or welding will be permitted on any parts having machined surfaces, except by written permission of the Commissioner.
- H. No rigging shall be done from any structure without the permission of the Commissioner, and the Contractor shall be completely responsible for any damage to the structure due to its operations.

- I. Only such equipment and materials as will not damage the structure or equipment and materials shall be used on the work.
- J. The Contractor shall be responsible for the exact alignment of equipment with associated piping and, under no circumstances, will "pipe springing" be allowed.
- K. Misaligned holes shall be reamed, as excessive driving of bolts or keys will not be permitted.
- L. The Contractor shall furnish and install all necessary plugs in lubrication holes to prevent entry of foreign material.

### 3.03 CLEARANCES AND SAFEGUARDS

- A. All devices, equipment and systems furnished under this Contract shall be fabricated and installed so that adequate clearances are provided for operation, maintenance, repair and replacement. It is the Contractor's responsibility to review the Contract Drawings and ensure that adequate clearances are available and to notify the Commissioner in the event that such clearances cannot be obtained.
- B. The construction arrangement, assembly locations and guarding of all equipment shall conform to the latest ANSI safety practices, the New York State Industrial Code and all standards specified in the Contract Documents.

### 3.04 ALIGNMENT AND LEVELING

- A. All couplings shall be aligned while the equipment is free from all external loads.
- B. Both angular and parallel alignment shall be checked, and the degree of misalignment shall be recorded and submitted to the Commissioner.
- C. Dial indicators shall be used for the checking of angular and parallel alignment. During rotation of the half couplings in performance of this test, they shall be maintained in the same relative position, and the dial indicator readings shall be taken at the same place on the circumference of the coupling.
- D. Misalignment shall not exceed the manufacturer's tolerances.

### 3.05 LUBRICATION

- A. All lubrication shall be performed by the Contractor in accordance with the lubricant specifications and directions furnished by the manufacturer. The Contractor shall furnish the lubricants for the equipment until it is accepted.
- B. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

3.06 MAINTENANCE OF INSTALLED EQUIPMENT

- A. During the time period between installation and receipt of the certificate of completion, the Contractor shall maintain all equipment in accordance with the equipment manufacturer's instructions and with the approval of the Commissioner.

-END OF SECTION-

**Section 01733**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for construction waste management.

**1.02 SUBMITTALS**

- A. The Contractor shall prepare and submit a Construction Waste Management Plan for review and approval by the Commissioner within 15 days after receipt of Notice to Proceed and prior to the removal of any construction waste or demolition materials from the Project site.

- B. The Construction Waste Management Plan shall contain the following:

1. Analysis of the proposed job site waste to be generated during the full construction period, including types and anticipated quantities of each as well as anticipated number and type of containers to be utilized to transport each waste stream. The list of construction waste materials shall include, as a minimum but not limited to, the following materials:
  - a. Cardboard
  - b. Clean dimensional wood
  - c. Concrete
  - d. Bricks
  - e. Concrete masonry units (CMU)
  - f. Asphalt
  - g. Metals from rebar, sheetrock studs, framing, etc.
  - h. Steel sheet piling
  - i. Steel pipe piles
  - j. Structural steel
  - k. Paints, solvents, and other hazardous fluids
  - l. Glass
  - m. Roofing
  - n. Wood pallets
  - o. Fencing materials, etc.
  - p. Arsenic impacted wood
2. Materials Handling Procedures: A description of the means by which any waste materials identified in Paragraph 1.02B.1 above will be protected from contamination and a description of the means to be employed in recycling the above materials consistent with requirements of the New York City Department of Sanitation.

3. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of such materials.
  4. Hazardous wastes: The Construction Waste Management Plan shall specifically note the proper method of disposal for anticipated hazardous wastes or potentially hazardous wastes such as oily rags, asphalt, greases, resins, epoxies, waterproofing agents, form oil, expended 55 gallon drums, concrete curing compounds, etc.
  5. The plan shall include the method of recycling office materials such as clean white paper, mixed paper, toner cartridges for laser printers, copiers and fax machines. Each item shall be recycled in accordance with the manufacturer's instructions.
  6. The plan shall specify a list of transporters, transfer stations and recyclers with addresses and phone numbers which the Contractor intends to utilize during the construction period for the purpose of complying with the Waste Management Plan. Each waste transporter or transfer station shall list the materials that they recycle and the percent of each material received which is recycled by their operations. All transporters must possess a valid transporter permit for handling the waste(s) as applicable. All disposal/reclamation/recycling facilities must be permitted in accordance with applicable regulations.
- C. Contractor shall submit to the Commissioner a record of each material recycled, reused, or salvaged and each construction waste dumpster removed from the Project on a monthly basis. The record shall include the amount of the material removed (in tons or cubic yards), the date on which it was removed, the receiving party and the cost of transportation and disposal of the material. This record shall include copies of manifests, weight tickets, receipts, or invoices for each item disposed.
- D. The Contractor shall submit executed copies of the waste manifests, bills of lading, and verification of disposal/recycling/reclamation to the City of New York to assure proper project close-out and final payment. Copies must be submitted within one week of disposal/recycling/reclamation. Final payment will not be made if the copies of manifests, bills of lading, and certificates of disposal/recycling/reclamation are not received by the City of New York and the Commissioner for all wastes transported offsite.

## PART 2 PRODUCTS

### 2.01 CONTAINERS

- A. The Contractor shall provide United States Department of Transportation (USDOT)-approved containers for containerization of all waste materials generated

as a result of the work under the Contract. If the containers are to be disposed of together with the waste they contain, the Contractor shall include costs for such containers in its lump sum bid.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. All waste streams shall be transported to approved disposal/reclamation/ recycling facilities that are permitted to accept such types of waste. The disposal/recycling/reclamation facilities shall be proposed by the Contractor and reviewed by the Commissioner. Review by the Commissioner will not release the Contractor from its obligation to comply with all applicable laws, rules, and regulations and shall not constitute a relief from the requirements of the Contract.

#### 3.02 CONSTRUCTION WASTE MANAGEMENT

- A. The Contractor shall utilize construction and demolition methods and processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors. Where economically feasible, as many of the materials from the generated waste shall be reused, salvaged, or recycled.
- B. When encountered as part of his work, the Contractor shall dispose of construction and demolition waste by recycling methods in accordance with Local Law 19/1989, Local Law 87/1992, and the Department of Sanitation "Rules Establishing Recycling Requirements for Private Carter Collected Waste" (latest version). In addition, the Contractor shall also arrange for disposal by recycling of untreated wood (scrap wood, pallets, etc.), green wood (stumps and tree parts), asphalt, brick and unpainted concrete block. All material to be recycled shall be separated from normal refuse, per Department of Sanitation (DSNY) Rules. Normal refuse and material not required to be recycled shall be disposed of by the Contractor as specified and in accordance with all State and Local codes and laws.

#### 3.03 DISPOSITION OF MATERIALS

- A. Demolition debris with adhered paint shall not be disposed of at an unlined municipal solid waste landfill.
- B. Arsenic-impacted wood (i.e., wood that failed Toxicity Characteristic Leaching Procedure [TCLP] test for arsenic) shall be disposed of as a hazardous waste at a permitted Subtitle C (hazardous) waste disposal facility.



## 3.04 RECORD KEEPING

- A. The Contractor shall be responsible for waste characterization and profiling. All disposal-associated documentation shall be submitted to the Commissioner for review prior to submittal to the disposition facility.
- B. The Contractor shall prepare the waste manifests and bills of lading for the transport and offsite disposal/reclamation of all waste materials. The Commissioner will review the waste manifests and bills of lading prior to offsite transport of waste materials. The following address shall be specified as a "Waste Generator" on the manifests and bills of lading:

New York City Department of Sanitation  
Bureau of Long Term Export – Engineering Unit  
44 Beaver Street, 7th Floor  
New York, New York 10004  
Telephone: (212) 437-5560
- C. Modifications to waste profiles, manifests, bills of lading, or any other associated documentation shall be made by the Contractor at the request of the Commissioner and/or the City of New York at no additional cost to the City of New York.
- D. The Contractor shall coordinate with disposal/recycling/reclamation facilities for a timely receipt of executed copies of hazardous waste manifests, nonhazardous waste manifests, bills of lading, and certificates of disposal/recycling/reclamation and shall provide original copies of these documents to the City of New York to the address specified in Paragraph 3.05B above for all wastes transported offsite. In addition, the Contractor shall submit copies of the above-referenced documents to the Commissioner within one week of disposal/recycling/reclamation.

-END OF SECTION-

**Section 01750**  
**SPARE PARTS AND MAINTENANCE MATERIALS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall furnish spare parts and maintenance materials as specified in the individual Specification Sections.
- B. Two complete spare sets of all lamps shall be supplied as a part of electrical control equipment furnished by the Contractor, unless otherwise specified.

**1.02 SUBMITTALS**

- A. Provide a letter of transmittal including the following:
  - 1. Date of letter and transfer of parts and materials
  - 2. Contract title and number
  - 3. Contractor's name and address
  - 4. A complete inventory of the parts and material, listing the applicable Specification Section for each
  - 5. A place for the City of New York to sign and signify receipt of the parts and materials
- B. A complete list of spare parts to be furnished shall be submitted to the Commissioner for approval as a part of the working drawing submittal.

**1.03 DELIVERY AND HANDLING**

- A. Parts and materials shall be furnished in manufacturers' unopened cartons, boxes, crates or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage which may be normally anticipated. They shall be clearly marked and identified.
- B. All parts shall be securely boxed and tagged, and clearly marked on the box and individually for identification as to the name of manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.
- C. During construction, store parts in buildings or trailers with floor, roof and closed sides and in accordance with manufacturers' recommendations. Protect from weather, condensation and humidity.

- D. Parts and materials shall be delivered to the City of New York upon completion of the Work or when the City of New York assumes beneficial occupancy. Contractor shall then place them in permanent storage rooms or areas approved by the City of New York.
- E. Contractor shall be fully responsible for loss or damage to parts and materials until they are transmitted to the City of New York.
- F. Upon acceptance of the spare parts by the Commissioner, the Contractor shall deliver the spare parts to the plant storage area.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01781  
PROJECT CLOSEOUT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Items to be completed
- B. Final copies - working drawings and record drawings
- C. Special tools and appliances
- D. Spare parts
- E. Lubricants
- F. Maintenance and guaranty
- G. Piping and equipment identification

**1.02 ITEMS TO BE COMPLETED**

- A. As construction of the project enters the final stages of completion, the Contractor shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items:
  - 1. Scheduling equipment manufacturers' visits to site.
  - 2. Required testing of project components.
  - 3. Scheduling start-up and initial operation.
  - 4. Scheduling and furnishing skilled personnel during initial operation.
  - 5. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Commissioner's "Punch" Lists.
  - 6. Attend to any other items listed herein or brought to the Contractor's attention by the Commissioner.
- B. Before the Certificate of Substantial Completion will be issued, the Contractor shall accomplish the cleaning and final adjustment of the various building components as specified and as follows:
  - 1. Clean all glass and adjust all windows and doors for proper operation.

2. Clean all finish hardware after adjustment for proper operation.
  3. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.
  4. Wax all resilient flooring materials.
  5. Remove bitumen from gravel stops, fascias, and other exposed surfaces.
  6. Remove all stains, marks, fingerprints, soil, spots and blemishes from all finished surfaces, tile, stone, brick and similar surfaces.
- C. In addition, and before the Certificate of Substantial Completion will be issued, the Contractor shall submit to the Commissioner certain records, certifications, etc., which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit all items which are required by the Contract Documents:
1. Test results of project components
  2. Performance Affidavits for equipment
  3. Certification of equipment or materials in compliance with Contract Documents
  4. Operation and maintenance instructions or manuals for equipment
  5. One set of neatly marked-up record drawings showing as-built changes and additions to the work under his Contract
  6. Any special guarantees or bonds
- D. The Contractor's attention is directed to the fact that required certificates and information under Paragraph 1.02C, above, must actually be submitted earlier in accordance with other Sections of the Specifications.

### 1.03 SPECIAL TOOLS AND APPLIANCES

- A. Special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment furnished under this Contract shall be provided in accordance the Specifications.
- B. The Contractor shall submit a complete list of special tools and appliances to be furnished, for approval by the Commissioner, as a part of the working drawing submittal.

- C. Special tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

#### 1.04 SPARE PARTS

- A. Spare parts shall be furnished in accordance with Section 01750 – Spare Parts and Maintenance Materials.

#### 1.05 LUBRICANTS

- A. The Contractor shall furnish and deliver to the Commissioner such oil, grease and any special lubricants that are necessary for proper operation of all equipment furnished under this Contract. Identification and listing of such lubricants shall be made as part of the working drawing submittal. The quantity furnished shall be sufficient for equipment start-up, operation prior to final acceptance of the work, and for operation during the guarantee period as defined in Article 24 of the Standard Construction Contract. The grade of lubricants furnished shall be in accordance with the recommendations of the equipment manufacturers made on the approved equipment working drawings.
- B. The Contractor shall furnish lubricants for all equipment supplied under this Contract in one delivery consisting of a minimum number of products, reflecting the results of the lubrication survey, as hereinafter specified.
- C. A lubrication survey, made by a lubricant supply firm, subject to the approval of the Commissioner shall be provided by the Contractor.
  - 1. The lubrication survey shall list all equipment furnished, under this Contract, with the equipment manufacturer's lubrication recommendations and an interchangeable lubricants tabulation standardizing and consolidating lubricants whenever possible.
  - 2. Twelve (12) copies of the approved Lubrication Survey shall be furnished prior to final acceptance.

#### 1.06 MAINTENANCE AND GUARANTY

- A. The Contractor must promptly repair, replace, restore or rebuild, as the Commissioner may determine, any work provided under this Contract in which defects of equipment, materials or workmanship may appear or to which damage may occur because of such defects, during the one-year maintenance and guaranty period subsequent to the date of final acceptance, except where longer periods of maintenance and guaranty are provided for in the Specifications.
- B. The Contractor shall provide the manufacturer's standard warranty for all materials and equipment furnished under this Contract unless otherwise specified. The warranty period shall begin at the time of Substantial Completion and shall extend

for the manufacturer's normal warranty period, unless a longer warranty period is defined in the specifications. Under no circumstances shall a warranty period be less than one year.

1.07 PIPING AND EQUIPMENT IDENTIFICATION

- A. The Contractor shall furnish and install identification signs for all equipment, control panels, valves and piping identification in accordance with Section 15076 - Piping and Equipment Identification.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 01811**  
**PRELIMINARY AND FINAL FIELD TESTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. System test procedures
- B. Contractor responsibilities
- C. Preliminary field tests of equipment and of systems
- D. Final field tests of equipment and systems
- E. Facility Operation test

**1.02 DEFINITION**

- A. A system for purposes of testing is defined as consisting of the component equipment, valves, piping, instrumentation, ducts, etc., which are so related as to form a complete unit. System testing is to demonstrate the capability of the equipment, interconnections and accessories to perform as specified.

**1.03 GENERAL REQUIREMENTS**

- A. All field tests, including equipment and systems tests, shall be performed in accordance with the requirements of the individual Specification sections and as described herein. The requirements contained herein shall apply, whether or not this Section is specifically referenced elsewhere in the Specifications.
- B. Field tests shall include preliminary field tests of equipment and systems and final field tests of equipment and systems at the site and a facility operation test.
  - 1. Preliminary and final field tests of equipment and systems and the facility operation test shall utilize the materials for which the equipment and systems are designed.
  - 2. All tests shall be performed in strict compliance with applicable manufacturer's and Commissioner's instructions.
  - 3. No testing of systems shall commence before the associated pipelines have been satisfactorily tested for leakage in accordance with Specification 02505 – Leakage Tests.
- C. For a successful test of equipment or system, the equipment or system shall operate trouble free for a continuous period of time as hereinafter specified. The test shall



demonstrate that the equipment and appliances are properly installed, meet their operating cycles and are free from defects such as overheating, overloading and undue vibration. If there are any interruptions in operation during the test, the test shall be repeated until the equipment or system operates trouble free for the specified time period.

- D. The successful operation of the equipment during final field testing will not constitute acceptance of the individual pieces of equipment. Acceptance will not be considered until the equipment has performed satisfactorily during the facility operation test.
- E. Nothing stated herein shall affect the requirements contained in Section 01415 - Miscellaneous Requirements; Section 01451 - Contractor's Quality Control or the testing of pressure and gravity piping systems at the test pressures specified. Such tests shall be performed at the scheduled time, prior to backfilling, encasement or enclosure, if applicable. However, checking structures and piping systems for leakage at the pressures developed, particularly for visible leakage, shall be performed as part of the tests included herein.

#### 1.04 SUBMITTALS

- A. The Contractor shall submit a preliminary and final field test schedule within 120 days after the Notice to Commence Work. The test schedule shall be updated and resubmitted every 2 months, or sooner if necessary, until completion of the required testing.
- B. The testing schedule shall include proposed test dates, preliminary or final field test, equipment or system being tested, specification references, equipment identification numbers, an indication of whether the test procedure has been submitted for approval and approval status.
- C. The Contractor shall notify the Commissioner in writing 30 days prior to any testing. The Contractor shall not proceed with any testing until the test procedure has been approved by the Commissioner.
- D. Before each test commences, the Contractor shall submit a detailed test procedure and manpower schedule for the approval of the Commissioner.

## 1.05 SYSTEM TEST PROCEDURES

- A. The following shall be considered a part of all system test procedures:
1. Variable capacity equipment shall be operated over the full capacity range of the maximum, minimum and at least three (3) intermediate points for a minimum of 30 minutes at each point.
  2. Multiple equipment groupings are to be operated both singly and together up to the maximum capacity of the system.
  3. All equipment items, including standby units shall be tested. It may be necessary to repeat system tests at maximum condition to insure that standby units are included in system tests.
  4. Each operating unit shall be run for at least one (1) hour alone (equipment field test) and for four (4) hours as a system at maximum capacity after reaching stable operating conditions.
  5. All equipment, interconnecting piping and accessories are to be checked for leakage and specified rate performance capability. Instrumentation and controls shall be tested as part of the equipment and systems to which they relate.
- B. The system shall include all equipment components, valves, piping, instrumentation, controls and accessories necessary for the proper functioning of each piece of equipment and the system as a whole.

## 1.06 CONTRACTOR RESPONSIBILITIES

- A. For preliminary field tests of equipment and systems, the Contractor shall furnish all labor, fuel, power, lubricants, materials, service and instrument air, instruments, equipment, etc., required for the tests.
- B. For the final field tests of equipment and systems, the City of New York will furnish energy, fuel, water, light and electrical instruments; and the Contractor shall furnish labor, lubricants, other materials, equipment and other instruments deemed by the Commissioner to be necessary and required for the tests.
- C. The Contractor shall furnish all labor necessary for supervision, adjustment and tuning of equipment as well as materials, instruments, equipment, etc., and any additional labor for testing not furnished by the City of New York.
- D. All testing shall be performed by the Contractor and witnessed by the Commissioner, DSNY Operations personnel and, when applicable, representatives of the Bureau of Electrical Control (BEC), Department of Buildings. Preliminary field testing of equipment and systems and final field testing of equipment and

systems shall be performed within the time periods designated in the preliminary CPM construction schedule during regular weekday daytime working hours.

- E. The Contractor shall notify the BEC in ample time before the tests so that they may observe the tests and perform tests of their own on the equipment during final test run.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 PRELIMINARY FIELD TESTS OF EQUIPMENT

- A. Each item of equipment shall be field tested and shall be run trouble free in accordance with the procedures prescribed in the Specifications, and shall demonstrate that equipment and appliances meet their operating cycles and are free from defects such as overheating, overloading and undue vibration.
- B. A successful test shall consist of at least one continuous hour, or longer if so specified, of trouble free operation.

### 3.02 PRELIMINARY FIELD TESTS OF SYSTEMS

- A. All systems shall be field tested and shall be run trouble free for four (4) continuous hours, or longer if so specified, for a successful test.
- B. The systems shall be tested by operating the systems equipment together as a unit with all related piping, valves, electrical controls and mechanical operations.
- C. The tests shall prove that all equipment and appurtenances of each system are properly installed, free from defects, meet their specified operating cycles and characteristics when operating as part of the system.
- D. System with automatic control systems shall be operated continuously by the automatic control system for the specified test period.

### 3.03 FINAL FIELD TESTS OF EQUIPMENT

- A. All equipment shall be tested with the materials for which the equipment was designed and shall be run trouble free for not less than four (4) hours continuously except as determined by the Commissioner, for a successful test.

### 3.04 FINAL FIELD TESTS OF SYSTEMS

- A. All systems shall be tested with the materials for which the equipment was designed and shall be run trouble free for four (4) continuous hours, or longer if so specified, for a successful test.

- B. Each system shall be tested by operating the equipment as a unit with all related piping, valves, ducting, electrical controls, instrumentation and mechanical operation. The tests shall prove that the system equipment, instrumentation, control logic and appurtenances are properly installed, free from defects, meet their operating cycles and characteristics as specified for that system.

3.05 FACILITY OPERATION TEST

- A. The facility operation test shall be conducted 16 hours per day for five consecutive calendar days.

3.06 MANUFACTURERS' REPRESENTATIVES

- A. A representative of the manufacturer of the equipment being tested shall be present during all field tests.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01821  
TRAINING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Training of plant personnel
- B. Video recording of training
- C. Lesson plans
- D. Training aids
- E. Qualifications of training specialists

**1.02 GENERAL REQUIREMENTS**

- A. The Contractor shall include in its lump sum price bid the cost to provide the services of qualified factory trained representatives of the equipment manufacturers for all equipment furnished under the Contract, who shall provide the following services.
  - 1. Supervise and assist in the installation of the equipment to ensure a proper installation of the equipment.
  - 2. Check the installation of the equipment and make all necessary adjustments prior to placing the equipment in service.
  - 3. Supervise field testing and start-up specified in Section 01811 - Preliminary and Final Field Tests. Additional acceptance testing supervision resulting from the failure to meet the specified performance requirements shall be at the Contractor's expense.
- B. The Contractor shall coordinate all equipment start-up services and training with the City of New York, the Commissioner and the manufacturer.

**1.03 TRAINING**

- A. The City of New York will provide the necessary personnel for training in the operation and maintenance of the equipment. The City of New York's personnel shall operate all equipment.
- B. The training shall consist of both classroom and field instruction. The purpose of field instruction shall be to reinforce topics covered in the classroom and to identify the location of any valves, pushbuttons, control panels switches, and other

equipment required for operation; and to identify the location of any maintenance equipment such as grease fittings, oilers, isolation valves, safety lockout switches, and other equipment.

- C. All training shall take place at the work site at a place specified by the City of New York and shall be conducted by qualified training specialists.
- D. Separate training sessions shall be conducted for City of New York mechanical operations and maintenance personnel and for City of New York electronic and electrical maintenance personnel.
- E. The Contractor shall coordinate the manufacturer's training services with the City of New York and the Commissioner, providing a minimum of 14 days prior notice of training, subject to the approval of the Commissioner and the City of New York.
- F. In order to provide training for an adequate number of City of New York operation and maintenance personnel, a minimum of two 8-hour training days shall be provided for each item of equipment at the site, unless otherwise specified.
- G. The Contractor shall deliver all training material to the Commissioner and the City of New York a minimum of 14 days prior to the scheduled training.
- H. Training shall be limited to no more than three days per week. No training shall be conducted on Mondays or Fridays.

#### 1.04 VIDEO RECORDING

- A. The Contractor shall provide a training specialist for a minimum of three (3) days, for each item of equipment specified, to meet with the Commissioner to prepare training scripts and to participate in video-recording of training.
- B. The manufacturer shall have the right of ownership of one unedited and one edited copy of the video-recorded training.
- C. As an alternative to video-recording training at the City of New York's plant, the manufacturer may submit for approval prerecorded DVD(s) covering the equipment supplied. Approval of such DVD(s) shall be contingent upon their content meeting the lesson plan requirement of this Section. If prerecorded DVD(s) are approved by the City of New York, the City of New York shall have the right to permanent ownership and use of at least one complete copy.

#### 1.05 LESSON PLANS

- A. The Contractor shall submit the equipment manufacturer's lesson plans which shall include specific information about each item of equipment or equipment system, including controls. Lesson plans shall include but not be limited to the following information and meet the following requirements.

1. The Contractor shall submit the equipment manufacturer's lesson plans for approval by the Commissioner no less than 60 days prior to the date that the training is to take place.
2. Lesson plans shall indicate the estimated duration of each segment of the training and the training audience that the instruction is to address. The training audience refers to City of New York mechanical operation and maintenance personnel and City of New York electronic/electrical maintenance personnel, as appropriate.
3. The lesson plan shall indicate when training aids are used or referred to during the course of instruction.
4. An outline of required lesson plan contents is included below.

B. Equipment Description

1. Purpose and function of equipment and auxiliary equipment and systems
2. Physical arrangement of equipment components and electrical supply
3. General function of controls, including automatic and manual operation, interlocks, and shutdowns

C. Equipment Operation

1. Operating requirement for equipment to perform satisfactorily
2. Typical operating characteristics
3. Start-up and shutdown procedures
4. Use of controls

D. Equipment Monitoring

1. Recommended routine instrument readings and operational checking.
2. Early warning signs of developing operational or equipment problems.
3. Procedures for handling non-routine problems such as alarms, power failures, component failures, etc.

E. Equipment operational trouble-shooting procedures.

F. Safety and Housekeeping

1. Safety features of the equipment
2. Safe practices



3. Housekeeping practices
- G. Description of the use of the equipment manufacturer's O&M Manual as regards operation.
- H. Preventive Maintenance Requirements
  1. Maintenance needs for equipment
  2. Identification of procedure to satisfy maintenance need (relate to equipment manufacturer's O&M Manual, which should have detailed descriptions of maintenance procedures).
  3. Outline or summarize procedures.
  4. Recommended schedule for performing preventive maintenance.
  5. Provide preventive maintenance record forms (if available).
- I. Maintenance Inspection Program
  1. Parts, components and areas of equipment to inspect for routine preventive maintenance
  2. Recommended frequency of inspection
  3. Inspection procedures
  4. Problem identification
- J. Maintenance Trouble-Shooting
  1. Sections in O&M Manual detailing trouble-shooting procedures.
  2. Summarize trouble-shooting procedures.
  3. Testing equipment used in trouble-shooting.
    - a. Demonstration of use of specialized testing equipment if supplied with equipment.
    - b. Other testing equipment.
  4. Tests used to verify trouble-shootings findings.

## K. Disassembly and Assembly

1. Summarize disassembly and assembly procedures.
2. O&M Manual coverage of subject.
3. Testing to verify success of corrective maintenance.

## L. Equipment Calibration

1. Calibration needs and tolerances
2. Calibration equipment
3. O&M Manual listing of calibration ranges, tolerances and settings.

## 1.06 TRAINING AIDS

- A. Training aids shall be used as an integral part of the training program. Training aids shall include text and/or pictorial handouts specific to the equipment supplied. Handouts shall be legible and printed on good quality stock. Handouts shall be submitted when lesson plans are submitted.
- B. Additional training aids shall be used for maximum training effectiveness and shall include the following as appropriate:
  1. Audio visual aids, for example, films, videos, slides, posters, blueprints, diagrams, and catalogue cuts.
  2. Models and samples, for example, cutaways, spare parts, tools, miniature models, equipment assemblies, and damaged parts.
- C. The use of additional training aids shall be identified in the lesson plan, and a description of the additional training aids shall be given.

## 1.07 QUALIFICATIONS OF TRAINING SPECIALISTS

- A. The Contractor shall submit the equipment manufacturer's documentation of the qualifications of their proposed training specialists for approval by the Commissioner 60 days prior to the date of proposed training. The documentation shall include the experience of the training specialists in operation and maintenance of the equipment and a summary of training experience.
- B. Only those training specialists whose qualifications have been approved by the Commissioner shall conduct training.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 01831**  
**OPERATION AND MAINTENANCE MANUALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Operation and maintenance manuals shall conform as specified herein.

**1.02 GENERAL REQUIREMENTS**

- A. As a prerequisite to obtaining payments in excess of fifty (50) percent of the equipment cost for equipment furnished under this Contract, the Contractor shall prepare, submit and obtain the Commissioner's approval, as designated by "No Exceptions Taken", of an Operation and Maintenance Manual for each item of equipment supplied under this Contract. Approval is a prerequisite for continuing payments for equipment furnished by the Contractor, providing instructional services and equipment start-up.
- B. Each Manual shall be prepared especially for this installation and shall include all pertinent and legible instructions, technical bulletins and other printed matter required to provide fully accurate and comprehensive information for the safe and proper operation, maintenance and repair of the equipment item.
- C. Payment for manuals shall be made only after these documents have been submitted to and approved by the Commissioner.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

-END OF SECTION-

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

NO TEXT ON THIS PAGE

**Section 02081**  
**FIRE HYDRANTS, POST HYDRANTS AND APPURTENANCES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown on the Contract Drawings specified herein and required to furnish and install fire hydrants, post hydrants and appurtenances complete and operational.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09911 - Exterior Painting

**1.03 REFERENCES**

- A. ASTM A126 - Specifications for Gray Iron Castings for Valves, Flanges and Pipe Fittings
- B. ASTM A536 - Specifications for Ductile Iron Castings
- C. ASTM B61 - Specifications for Steam or Valve Bronze Castings
- D. ASTM B62 - Specifications for Composition Bronze or Ounce Metal Castings
- E. AWWA C502 - Dry-Barrel Fire Hydrants
- F. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
- G. AWWA C600 - Installation of Ductile Iron Water Mains, and Their Appurtenances
- H. New York City Fire Department Standards
- I. New York City Building Code
- J. New York City Department of Environmental Protection (NYCDEP) Bureau of Water Supply Standard Water Main Specifications

**1.04 GENERAL REQUIREMENTS**

- A. All fire and post hydrants shall turn clockwise to close, unless otherwise specified.
- B. All fire and post hydrants shall have permanent markings for direction to open.

C. Fire and post hydrants shall be provided with restrained mechanical joints.

D. Fire protection hydrants and valves shall be U.L. listed.

#### 1.05 SUBMITTALS

A. Submit the following Shop Drawings and other data for approval in accordance with Section 01330 – Shop Drawings:

1. Product data sheets for make and model
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction
3. Certificates of compliance with AWWA Standards for all fire hydrants
4. Certificates of acceptability by the NYC Department of General Services
5. Shop drawings and bill of materials for hose storage houses and equipment

B. Shop test results and inspection data.

C. Operation and Maintenance Data: Submit complete manuals including copies of all Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

#### 1.06 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 3 years of experience in the production of substantially similar hydrants.

B. Each type of hydrant shall be the product of one manufacturer.

#### 1.07 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be delivered to the site to ensure uninterrupted progress of the Work.

B. Hydrants and appurtenances shall be handled carefully. Hydrants and hose houses which are dropped, dented, cracked or otherwise damaged will not be acceptable.

#### 1.08 SPARE PARTS

A. The Contractor shall furnish all special tools necessary to service, disassemble, repair and adjust the equipment. Deliver all spare parts, tools and supplies with the equipment, neatly boxed, indexed and tagged with complete information for use and reordering.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. The following manufacturers are acceptable. Equivalent products of other manufacturers may be submitted for approval.
- B. Fire Hydrants
  - 1. M&H Valve Company Division, McWane Corporation  
P.O. Box 2088, Anniston, Alabama  
Phone - 256 237 3521
  - 2. Clow Valve Company Division, McWane Corporation  
902 S. 2nd St., Oskaloosa, IA 52577  
Phone - 515 673 8611
  - 3. Kennedy Valve Company  
1021 E. Water Street, Elmira, NY  
Phone - 607 734 2211
  - 4. Or approved equal
- C. Post Hydrants
  - 1. Josam Manufacturing Company  
525 West Highway 20, Michigan City, IN 46360  
Phone - 219 872 5531
  - 2. Zurn Industries, Inc.  
14801 Quorum Drive, Dallas, TX 75240-7584  
Phone - 972 560 2000
  - 3. Jay R. Smith MFG. CO.  
2781 Gunter Park Dr., E. Montgomery, AL 36109-1405  
Phone - 334 277 8520
  - 4. Or approved equal
- D. Bilge Water Hydrant Couplings and Adapters
  - 1. Emco Wheaton c/o Epic Equipment  
38 Congress Circle, Roselle, IL 60172  
Phone - 630 351 0885



2. Meggitt Fuelling Products  
12838 Saticoy Street, North Hollywood, CA, 91605-3505  
Phone – 818-759 – 2194
3. South Park Corporation  
1019 Concord Street North, South Saint Paul, MN, 55075  
Phone – 641 – 455 - 4510
4. Or approved equal

E. Hose Storage Houses

1. Croker Division, Fire End and Croker Corporation  
7 Westchester Plaza, Elmsford, NY 10523  
Phone - 1-800-759-FIRE
2. Potter-Roemer, Incorporated  
3100 S. Susan St., Santa Ana, CA 92204-6437  
Phone - 800 366 3473
3. Dixon Powhatan  
800 High Street, Chestertown, MD, 21620  
Phone - 877-712-6179
4. Or approved equal

2.02 FIRE HYDRANTS

A. General

1. Provide hydrants in accordance with NYCDEP Bureau of Water Supply Standard Water Main Specifications for Installing Hydrants.
2. Provide compression type hydrants with breakaway flange and stem.
3. Opening shall be against flow to prevent leakage in the event of a traffic accident.
4. Barrel shall automatically drain and remain dry after use.
5. Top shall be isolated from the waterway by packing or O-rings.
6. Rising stem to indicate hydrant in the open or closed position.

**B. Materials of Construction**

1. Body and Bonnet: Cast Iron, with fusion bonded epoxy in accordance with AWWA C550
2. Main Valve: Bronze with bronze seats and rubber facing
3. Drain Valves: Bronze
4. Drain Valve Rod: Steel
5. Main Valve Stem: Solid Steel
6. Working Pressure: 150 psig
7. Shop Test Pressure: 300 psig

**C. Breakaway Features**

1. The groundline flange bolts shall be breakable.
2. A breakaway coupling shall be provided in the valve stem.

**D. Miscellaneous Features**

1. A drain valve shall be actuated when the main valve is in the closed position to maintain the barrel in a dry condition.
2. Hydrant shall have two 2-1/2 inch fire hose connections and one 4-1/2 inch pumper nozzle, each with standard NYC Fire Department threads and dust-cap with stainless steel chain. Contractor shall verify threads are compatible with NYC Fire Department standards.
3. Main valve shall be 5-1/4 inch.
4. End connection shall be 6-inch mechanical joint.
5. Hydrants shall be provided with extensions as required for the depth shown on the Contract Drawings.

**2.03 POST HYDRANTS****A. General**

1. Non-freeze type with non-turning operating rod and free-floating compression closure valve.
2. Barrel shall automatically drain and remain dry after use.

3. Top shall be isolated from the waterway by packing or O-rings.

4. Non-rising stem with lubrication hole in operating nut.

B. Materials of Construction

1. Body and Bonnet: Bronze with cast aluminum casing guard

2. Main Valve: Bronze with bronze seats

3. Drain Valves: Bronze

C. Miscellaneous Features

1. A drain valve shall be actuated when the main valve is in the closed position to maintain the barrel in a dry condition.

2. Hydrant shall have two 1-1/2 inch NPT hose connections with threaded quick disconnect adapters.

3. Operating nut shall be provided with a T-handle operating key.

4. Drain port shall be 1/2-inch, minimum.

5. Inlet shall be 2-inch threaded connection.

6. Main valve shall be 1-1/2 inch.

2.04 BILGE WATER HYDRANT COUPLER AND ADAPTER

A. General

1. 3-inch coupler with Buna seals, 90-degree swivel, and a 3-inch female NPT inlet. Coupler shall be Emco Wheaton Dry-Break model number J73C-ABN2-B or approved equal.

2. 3-inch adapter with Buna seals, a 3-inch female NPT inlet, and dust cap. Adapter shall be Emco Wheaton Dry-Break model number J73A-BBN0-B or approved equal.

B. Materials of Construction

1. Coupler body: anodized aluminum

2. Adapter body: brass

2.05 HOSE STORAGE HOUSES

A. At each fire hydrant, Contractor shall supply a hose storage house.

- B. Hose storage house shall be fabricated from 16 gauge steel with red enamel finish, top and bottom hinges, locking access doors, built-in shelf and ventilation slits.
- C. Hose house shall rest on 24-inch high support legs fabricated from structural steel shapes and adequately braced to withstand wind pressures in accordance with the New York City Building Code. Hose house shall have the following minimum dimensions: 42-inch high by 60-inch wide by 15-inch deep.
- D. Hose houses shall each contain the following minimum supplies:
  - 1. 250-feet of 2-1/2 inch rubber lined hose with screw brass coupling
  - 2. Two smooth bore, 2-1/2 inch by 1-1/8 inch nozzles
  - 3. One hydrant wrench
  - 4. Four 2-1/2 inch spanner wrenches
  - 5. Two hose and ladder straps
  - 6. One crowbar
  - 7. One 2-3/4 pound fire axe
  - 8. Two 2-1/2 inch washers

## 2.06 ANCHORAGE DEVICES

- A. All bolts, nuts and washers furnished for connection of the hose houses to the concrete structure or other structural members shall be of Type 316 stainless steel, and shall be of ample size and strength for the purpose intended. Anchor bolts shall be hooked type.

## 2.07 SURFACE PREPARATION AND PAINTING

- A. Clean and prime coat ferrous metal surfaces in the shop in accordance with Section 09911 - Exterior Painting.
- B. Finish paint ferrous metal surfaces in the shop using the manufacturer's approved standard finish system. Finish system shall be compatible with the primer specified in Section 09911 - Exterior Painting.
- C. Coat bearing, gear and similar machined, polished or non-ferrous metal surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.
- D. Stainless steel shall not be painted.

## PART 3 EXECUTION

### 3.01 INSTALLATION OF FIRE AND POST HYDRANTS

- A. Install hydrants in accordance with AWWA C600 and NYCDEP Bureau of Water Supply Standard Water Main Specifications.

- B. All hydrants shall be set on a 1/3 cubic yard of 3/8" crushed gravel wrapped in engineering fabric.
- C. For hydrants not cast-in-concrete slabs, the hydrants shall be set plumb and centered in the trench. The earth fill around each hydrant shall be carefully tamped to a lateral distance of 4 feet on all sides of the hydrant, or to the undisturbed trench face if less than 4 feet.
- D. All hydrants shall have a minimum 48-inch depth of bury.
- E. Furnish each hydrant with a shut-off gate valve, valve box, fenders, and other appurtenances as shown on the Contract Drawings.

3.02 FIELD PAINTING

- A. Provide field touch up painting of scratched or damaged surfaces, using primer, intermediate and finish paints provided by the manufacturer, in accordance with Section 09911 – Exterior Painting.

3.03 FIELD TESTS AND ADJUSTMENTS

- A. All parts and components shall be adjusted as required to provide correct operation.
- B. A functional field test of each hydrant shall be conducted in the presence of the Commissioner to demonstrate that each part and all components function together correctly.
- C. Each hydrant shall be furnished with a shutoff gate valve and valve box.
- D. Hydrostatic tests shall be combined with the testing of the entire pipeline to which each hydrant is connected.

-END OF SECTION-

**Section 02105**  
**IN-SITU SOIL SAMPLING, TESTING AND LABORATORY ANALYSIS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, tools, and equipment to perform all operations necessary to determine the in-situ classification, handling and disposal requirements of all soils and fill materials in the area to be excavated during construction.
- B. The Contractor shall develop and implement an In-situ Soil Sampling and Analysis Plan required for sampling, quality assurance and quality control (QA/QC) of work. Work includes, but is not necessarily limited to, sampling and analysis of on-site soils.
- C. The Contractor shall provide a Field Sampling Plan to test all soils and fill materials for presence of chemicals to determine if material is Hazardous Waste, Industrial Waste, Petroleum-contaminated Waste or Construction and Demolition Debris.
- D. The Contractor shall provide the services of a laboratory, certified by New York State Department of Health, to perform testing and chemical analyses.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 02225 - Impacted Soil Handling
- C. Section 02240 - Dewatering
- D. Section 02316 - Excavation
- E. Section 02317 - Backfilling

**1.03 REFERENCES**

- A. EPA QA/G-4, Guidance for the Data Quality Objectives Process, February 1998.
- B. Procedures for Handling and Chemical Analysis of Sediment and Water Samples, EPA/ACE-81-1, May 1981.
- C. Test Methods for Evaluating Solid Waste, USEPA Office of Solid Waste, SW-846, 3rd Edition, Final Update III, December 1996, or latest revision.
- D. Federal Register Vol. 51, No. 114, 06/13/86, 40 CFR Part 261.
- E. Methods for Chemical Analysis of Water and Wastes, USEPA Environmental Monitoring and Support Laboratory, EPA 600/4-79-020, Revised March 1983.

## F. American Society for Testing and Materials (ASTM) Standards:

1. D422 - Method for Particle-Size Analysis of Soils
2. D1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
3. D1557 - Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb (4.5 kg) Hammer and 18-in (457 mm) Drop
4. D 2922 - Tests for Density of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth).

## G. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section 650 (Subpart p - Excavations)

## H. State of New York DEC General Discharge Permit

## I. EPA CLP, Revision OLM03.1, August 1994

## J. EPA Superfund Target Compound List (TCL)/Target Analyte List (TAL)

## K. 6NYCRR Part 371, Section 371.3 , Toxicity Characteristic Leachate Procedure (TCLP) for VOCs, semi-VOCs, metals, pesticides or herbicides or CFR Section 261

## L. NYS DEC STARS Memo No.1, Petroleum-Contaminated Soil Guidance Policy, August 1992

## M. NYS DEC Technical Administrative Guidance Memorandum (TAGM) HWR 94-4046, January 24, 1994 (Revised)

## 1.04 DEFINITIONS

- A. Analyte-free Water: Water containing less than the detection limits for volatile organics, pesticides, PCB's and inorganics. Compliance shall be verified by either the supplier or by an analytical laboratory.
- B. Excavated Material: Includes all material removed from the ground regardless of type, character, composition, moisture, or condition thereof. All material will be classified by the Commissioner, prior to excavation, following receipt of in-situ soil sampling results from the Contractor, and disposed of accordingly.
- C. Regulated Solid Waste
  1. Hazardous Solid Waste: Material shall be considered a hazardous waste when it exhibits any of the following characteristics: ignitability, corrosivity,

reactivity, or toxicity for Volatile Organic Compounds (VOCs), semi-VOCs, metals, pesticides, or herbicides, as defined in 6 NYCRR Part 371 or 40 CFR Section 261. Under New York State (NYS) regulations, a material that contains greater than 50 ppm of PCBs is considered a hazardous waste. The Environmental Protection Agency (EPA) considers greater than 50 ppm of PCB to be a PCB-contaminated waste under Toxic Substances Control Act (TSCA). All hazardous waste shall be considered unsuitable, and shall be disposed of at an approved permitted hazardous waste landfill.

## 2. Industrial Waste

- a. Solid waste generated by manufacturing or industrial processes. Such processes may include, but are not limited to the following: electric power generation; fertilizer/agricultural chemicals; inorganic chemicals; iron and steel manufacturing; organic chemicals; and all other materials as defined in 6 NYCRR Part 360. The forms of such wastes are exemplified by but not limited to: liquids such as acids, alkalis, caustics, leachate, petroleum (and its derivatives), and processes or treatment wastewaters; sludges which are semi-solid substances resulting from process or treatment operations or residues from storage or use of liquids; solidified chemicals, paints or pigments; and dredge spoil generated by manufacturing or industrial processes, foundry sand, and the end or by-products of incineration or other forms of combustion.
  - b. Soil and fill material containing industrial waste shall be considered industrial waste. Evidence that a soil or fill material contains industrial waste shall include visual identification of waste, chemical odors, vapor emission, chemical staining, and analytical data that exceeds that exceeds the concentration limits in (1) NYS DEC Technical Administrative Guidance Memorandum (TAGM) HWR-94-4046 for VOCs, semi-VOCs, organic pesticides/herbicides, and heavy metals; or (2) Spill Technology and Remediation Series (STARS) Memo # 1, NYSDEC, August 1992 guidelines, whichever is more stringent.
- ## 3. Construction and Demolition (C&D) Debris:
- Uncontaminated solid waste resulting from the construction, remodeling, repair and demolition of utilities, structures and roads; and uncontaminated solid waste resulting from land clearing. Such waste includes, but is not limited to bricks, concrete, and other masonry materials, rock, and uncontaminated soil. Uncontaminated solid waste means C&D debris that is not mixed with other solid waste (i.e., industrial waste) at the point of generation, processing or disposal, and that is not contaminated with spills of a petroleum product, hazardous waste, or industrial waste. Soil and fill material may only be considered uncontaminated if it is associated with analytical data that meets the concentration limits in the NYS DEC TAGM or STARS Memo #1, NYSDEC, August 1992 guideline, whichever is more stringent.



4. Petroleum-contaminated Waste: Exhibits a discernible petroleum-type odor, contains visible petroleum product, may be associated with a reported spill, or material associated with sample data that exceeds concentration limits in STARS Memo #1, NYSDEC, August 1992.
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- D. Non-regulated Solid Waste: This applies to materials that, before being beneficially used (as determined by the NYS DEC), were solid waste. Material is no longer considered solid waste when used as described: uncontaminated soil which has been excavated as part of a construction project, and which is being used as a fill material, in place of soil native to the site of disposition; non-hazardous contaminated soil which has been excavated as part of a construction project, other than a NYS DEC-approved or undertaken inactive waste disposal site remediation program, and which is used as backfill for the same excavation or excavations containing similar contaminants at the same site. Excess materials on these projects are subject to the requirements of 6 NYCRR Part 360; non-hazardous petroleum-contaminated soil which has been decontaminated to the satisfaction of the NYS DEC and is being used in a manner acceptable to the NYS DEC; recognizable, uncontaminated concrete and concrete products, asphalt pavement, brick, glass, soil and rock placed in commerce for service as a substitute for conventional aggregate; non-hazardous petroleum-contaminated soil when incorporated into asphalt pavement products by a producer authorized by the NYS DEC; and all other uses as described in 6 NYCRR Part 360, Section 360-1.15.
  - E. In-situ Soil Sampling: Samples shall be collected in-place using split spoons or shelby tubes as detailed in the Field Sampling Plan. The area to be excavated shall be divided into distinct vertical and horizontal segments, identifying the volume of soil or fill that each sample will represent. Sampling shall be continuous vertically to allow for compositing of samples for proper classification.
  - F. Grab Sample: A grab sample is collected from one particular location at a specific time. This sample, when analyzed, represents the composition of the source soil at that location and time only.
  - G. Composite Sample: A composite sample is comprised of grab samples which are initially collected from within a grid area and then combined into a single sample. This sample is representative of the entire grid area from which the grab samples were collected.
  - H. Split Sample: The Contractor shall provide the Commissioner with random (at least 10 percent) split samples of soils. Split samples are to be used to verify waste characterization for off-site disposal.

## 1.05 SUBMITTALS

- A. The Contractor shall provide all submittals, including the following, as specified in Section 01330 - Shop Drawings.

1. Field Sampling Plan (FSP): An FSP shall be submitted for approval 30 days following notice to proceed. The FSP shall include protocols for the collection and analysis of representative samples from the soil based on the receiving disposal facilities' protocols including sampling frequency and analysis requirements as described in Article 1.10. The Commissioner will approve the FSP only if it clearly provides the information to allow for classification of all material proposed for excavation. No sampling shall be conducted until the Commissioner has reviewed and formally approved the FSP in writing. The FSP shall include the following at a minimum:
  - a. A detailed outline of the disposal facility requirements. The information, including analytical requirements and sampling frequency specified by the disposal facilities shall be submitted to the Commissioner and used by the Contractor in preparing the site-specific FSP.
  - b. The FSP shall include an indication of the specific frequency of in-situ samples per unit volume as required by the approved disposal facility chosen by the Contractor, but not fewer than one composite sample for each 500 cubic yards of material to be excavated. Parameters analyzed shall be at a minimum full RCRA Characteristics including ignitability, corrosivity, reactivity, and full Toxicity Characteristic Leachate Procedure (TCLP) for volatiles, semi-volatiles, metals, pesticides and herbicides, and as required by the disposal facility. The area to be excavated shall be divided into distinct vertical and horizontal segments, identifying the volume of soil or fill that each sample will represent. The FSP shall include vertically continuous sampling to allow for compositing of samples for proper classification of soils. The Contractor shall analyze each composite sample for PCBs also.
  - c. A scaled map of the site showing existing fixed landmarks and the proposed excavation limits. The map shall contain specific sampling locations that will conform to the disposal facilities' sampling frequency requirements.
  - d. Identification numbers of the sample grids, relative depth, sampling intervals, and volumes reflective of the Contractor's excavation method shall be shown on the scaled site map. Sampling intervals shall account for existing subsurface data, historic sampling information, including: descriptions, depths, orientation, and location of material of potentially different classifications, and shall minimize undue mixing of varied native soil and fill material.

- e. Description of sampling procedures and equipment to be used.
  - f. Name and address of Analytical Laboratory, copy of laboratory certification, Quality Assurance Manual, and Standard Operating Procedures for the analyses to be performed.
  - g. Description of QA/QC samples required by the disposal facilities.
  - h. Description of additional disposal facility requirements.
2. In-situ Soil Sampling and Analysis Plan: The primary objective of this plan is to characterize on-site soils for transport and disposal off-site. An In-situ Soil Sampling and Analysis Plan (ISSAP) includes a detailed description of techniques used to select sampling sites, thoroughly addresses procedures to be used to obtain representative samples of the media to be sampled, and describes sampling parameters and methods, as required by the disposal facility, sampling equipment, containers, sample number and volume, preservation, and holding times. This plan will also include QA/QC procedures and a quality management (QM) plan. The ISSAP shall address all requirements of these specifications and all requirements of New York State, EPA and OSHA and the selected disposal facility. If any conflicts arise between different agency procedures, the Commissioner will determine which method is to be used. The Contractor shall submit the ISSAP for review and approval a minimum of 30 calendar days prior to the scheduled commencement of excavation activities. No excavation work will be allowed until all changes required by the Engineer are made and the ISSAP is accepted in writing by the Engineer. The ISSAP shall include at a minimum the following elements:
- a. The organizational structure of the Contractor's and all subcontractors' quality management (QM) personnel, including their:
    - (1) Names
    - (2) Resumes
    - (3) Responsibilities
    - (4) Authorities
    - (5) Qualifications
  - b. A copy of a letter signed by a responsible officer of the Contractor describing the authority and responsibilities of the Sampling and Analysis Manager.
  - c. Laboratory Requirements and Qualifications. The laboratory's name, certifications, Quality Assurance Manual, and Standard Operating Procedures (SOPs) for the analyses to be performed shall be submitted to the Engineer and the City for review and approval.

- d. Proposed sampling, handling, preservation, and storage of equipment and procedures, including transfer procedures, and sampling equipment decontamination procedures.
  - e. Analytical Methods. Proposed analytical methods shall be in accordance with SW-846, latest edition. If an SW-846 Method is not available, then EPA 600/4-79-020 shall be used.
  - f. Data Quality Objectives. Procedures for assessing precision, accuracy, degree of representation, comparability and completeness of samples and data, including performance audits and proposed protocols for corrective measures where problems are identified shall be defined.
  - g. Schedule of field and laboratory inspections.
  - h. Planned preparation of daily and project summary quality control reports.
  - i. A statement that the sampling program is in accordance with the Contract requirements.
  - j. Precise number and approximate location of samples to be collected and the specific analyses to be performed on each sample, presented in a Microsoft Excel table, and on a working drawing that is keyed to the Contract Drawings.
  - k. Manufacturer, catalog data and calibration records of all analytical equipment to be used on-site.
3. Field Sampling Summary Report: The field sampling summary report shall contain all laboratory analytical results obtained from the field sampling event. A detailed account of any field procedures used which deviated from those established in the FSP shall be included, as well as a complete set of field notes. Detailed field notes shall be maintained by the Contractor during sampling and excavation to allow identification of sample analysis results with the respective grids that the data represent, and to verify quantities of materials to be disposed of as hazardous waste, industrial waste, petroleum-contaminated waste or C&D debris. The field notes shall be made available to the Commissioner during the sampling program, and shall consist of:
- a. Boring or probe logs from each sampling location containing a continuous stratigraphic description of all material encountered to the excavation depth required. Descriptions of material shall include, but not be limited to, color, odor, staining, relative grain size distribution, material composition, moisture content, and cohesive properties.
  - b. The location of each sampling point on a scaled map.

- c. Depth intervals for each sample, whether a grab or composite, and any special notes, which are included on the laboratory chain-of-custody forms.
  - d. Copies of all laboratory chain-of-custody forms for samples that are collected for analysis.
4. Analytical Results: Contractor shall submit analytical results for sampled soil material to the Commissioner within 3 calendar days of receipt of such data from the laboratory.

#### 1.06 QUALITY ASSURANCE

A. Laboratory Requirements: Laboratory facilities shall meet, at a minimum, the requirements and procedures of this specification. The laboratory is subject to inspection and prior approval by the Engineer.

- 1. Provide and coordinate the services of a laboratory(ies) to perform specified services and analyses. Laboratory services shall be provided for the duration of the work.
- 2. The laboratory shall maintain, throughout the duration of the work, the appropriate New York State Department of Health ELAP Certifications for the analyses to be performed.

#### B. Permits and Regulations

- 1. The Contractor shall obtain all necessary permits and perform all work in compliance with applicable requirements of OSHA and other governing authorities having jurisdiction.
- 2. Codes and Standards: State and City laws and regulatory requirements shall govern the transport and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

#### C. Laboratory Qualifications

- 1. Analytical Methods and Procedures: Fully describe and provide references (SOPs) for the specific analytical methods and procedures which will be used to perform all soil chemical analyses associated with this project. The analytical methods and procedures shall be used to determine sample characterization and suitability for transportation and disposal.
- 2. Quality Control Checks and Data Acceptance: Provide a system of internal quality control checks designed to establish technically sound criteria for each measurement parameter, which will serve to accept or reject data in a uniform and systematic manner. A minimum of ten percent of the total number of a

given type of sample shall be devoted to internal QC checks, or more, as specified in the laboratory SOP. These checks are designed to ensure accuracy in the sampling procedure and the analytical methods and include blanks, duplicates, matrix spikes, reference standards and performance evaluation samples.

- D. Data Management: Manage the analytical data by utilizing a computer spreadsheet or database program as approved by the Engineer. Data shall be organized in such a way that all samples may be tracked from collection through analysis.
1. The analytical results generated for a ten (10) day turn-around time deliverable shall include a Form I (or equivalent) showing compounds analyzed for, and concentrations detected, and associated chain-of-custody reports to the Engineer.
  2. The final data package generated by the laboratory shall include the following information:
    - a. A Form I showing pertinent physical data presented in concise, easy to follow formats (i.e., sample number, laboratory ID, client, date of sample preparation, date analyzed, percent moisture, dilution factor, sample matrix, units, undetected and detected compounds, etc.)
    - b. Reference to analytical methodology used.
    - c. General discussion including a description of sample types, tests performed, any problems encountered, and any general comments (case narrative)
    - d. Data from each discrete sample reported using cross-referencing between site samples and quality control samples and including all pertinent dates, information and reporting limits
    - e. Associated quality control samples such as blanks, spikes and spike duplicates, laboratory duplicates, laboratory control samples, field duplicates and appropriate check standards
    - f. Copies of chain-of-custody sheets
    - g. The analytical results shall be provided in a tabular Microsoft Excel 97 format, delivered on 3-1/2 inch diskettes or via electronic mail to the Engineer. All electronic data shall be certified to be virus-free.

- E. In-situ Sampling: All material shall be in-situ sampled and analyzed in accordance with the disposal facility requirements and as specified herein.
  - 1. Field duplicate samples shall be collected for a minimum of 10 percent of the samples spaced throughout the sample program.
  - 2. The number of samples required for a quantity of soil shall meet all disposal facility requirements, and the approval of the Engineer.
- F. Sample Turn-Around: The Contractor shall provide for prompt sampling and turn-around of analysis so as not to delay the project. If a turn-around time of less than 10 days is required due to delays in construction scheduling or other constraints, Contractor shall provide for such at no additional cost to the City.
- G. Disposal Facility Selection: If the approved disposal facility is not available when disposal operation begins, the Contractor shall be fully responsible for procuring approved disposal facilities at no additional cost to the City. Any additional sampling and analysis required and labor involved in submitting new disposal facilities after the initial disposal facilities are accepted shall be the responsibility of the Contractor.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Sample Identification: All samples shall be identified with a sample label in addition to an entry on a chain-of-custody record. The label shall be identified upon receipt by the laboratory and cross-referenced to the chain-of-custody record. Any inconsistencies shall be noted on the custody record. Laboratory personnel shall notify the Sampling and Analysis Manager immediately if any inconsistencies exist in the paper work associated with the samples, and Contractor shall collect new samples to replace those with inconsistencies which cannot be rectified.
- B. Sample Labels: The field team shall complete the following information on a sample label for each sample bottle:
  - 1. Site Name
  - 2. Job Number
  - 3. Sample Number
  - 4. Sample Description
  - 5. Sampling Company Name
  - 6. Parameters to be Analyzed
  - 7. Date
  - 8. Time
  - 9. Preservation Technique Employed
  - 10. Sample labels shall be attached to the sample bottles

**C. Completion of Chain-of-Custody Record:**

1. Maintain a chain-of-custody record on all samples. A chain-of-custody record is a printed multi-part form that accompanies a sample or group of samples as custody is transferred from person to person. A chain-of-custody record is a controlled document.
2. As soon as is practical after sample collection, preferably after decontamination, the following information shall be entered on the chain-of-custody form. All information shall be recorded in ink.
  - a. Project number: Enter the alphanumeric designation assigned by the field team that uniquely identifies the project site.
  - b. Project name: Enter the site name.
  - c. Samplers: Sign the name(s) of the sampler(s).
  - d. Station number: Enter the sample number for each sample in the shipment. This number appears on the sample identification label.
  - e. Date: Enter a six-digit number indicating the year, month, and day of sample collection.
  - f. Time: Enter a four-digit number indicating the time of collection in 24-hour time; for example, 1354.
  - g. Composite or grab: Indicate the type and matrix of sample.
  - h. Station location: Describe the location where the sample was collected.
  - i. Number of containers: For each sample number, enter the number of sample bottles that are contained in the shipment.
  - j. Remarks: Enter any appropriate remarks.

**D. Sample Shipment**

1. Custody of samples shall be maintained through the shipment of samples to the selected laboratory(ies). All samples shall be packaged and shipped daily to ensure that no sample is held at the site more than 24 hours. Samples shall be delivered directly to the laboratory using the following procedures:
  - a. Use waterproof high-strength plastic ice chests or coolers only.
  - b. After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid. For bottles



other than VOA sample bottles, secure the lid with tape. (Tape on VOA bottles may cause contamination.)

- c. Place inert cushioning material such as vermiculite or "bubble-wrap" in the bottom of the cooler.
  - d. Enclose the bottles in clear plastic bags through which sample labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they do not touch and will not touch during shipment.
  - e. Put in additional inert packing material to partially cover sample bottles (more than half-way). Place double-bagged crushed ice around, among, and on top of the sample bottles.
  - f. Fill cooler with cushioning material.
  - g. Put paperwork (chain-of-custody record) in a waterproof plastic bag and tape it with packing tape to the inside lid of the cooler.
  - h. Tape the drain shut.
  - i. Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
  - j. Attach completed shipping label to top of the cooler.
  - k. Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of coolers containing glass containers.
  - l. Ship the cooler overnight by commercial carrier (e.g., Federal Express, UPS), laboratory carrier or field personnel to the respective laboratory.
2. Custody forms for the samples shall be signed by the Contractor's designated representative who is relinquishing custody. The custody form shall include the air bill number, method of shipment, and time and date of the transfer of custody.
  3. Custody seals shall be applied to the front and back of the sample coolers. A shipping label with return address shall be applied as well as the air express bill and any U.S. Department of Transportation (DOT) required labels or markings.
- E. Transferring Custody of Samples to Shipper, if applicable: Contractor shall transfer custody of samples to a shipper as follows:
1. Sign, date, and enter time on the chain-of-custody report under "Relinquished by."

2. Make certain that shipper signs the "Received by" entry.
  3. Enter name of the carrier under next "Relinquished by" category. Receiving laboratory shall sign "Received for Laboratory by" on lower line and enter date and time.
- F. Transferring Custody from Sampler or Shipper to Common Carrier:
1. The shipper or Contractor shall transfer custody of samples to a common carrier as follows:
    - a. Sign, date, and enter time under "Relinquished by" entry.
    - b. Enter name of carrier (e.g., UPS, Federal Express) under "Received by."
    - c. Enter bill-of-lading or Federal Express airbill number under "Remarks."
    - d. Place the original of the chain-of-custody form in the appropriate sample shipping package. Retain a copy with field records.
    - e. Sign and date the custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field.
    - f. Wrap the seal across filament tape which has been wrapped around the hinges of the shipping package at least twice.
    - g. Fold the custody seal over on itself so that it sticks together.
    - h. Complete other carrier-required shipping papers.
  2. In instances when the Common Carrier will not accept responsibility for handling chain-of-custody forms, the Contractor shall ensure that the record is packed within the sample package.
- G. Laboratory Custody Procedures: Once the samples arrive at the laboratory, the Contractor shall ensure that custody of the samples is maintained by laboratory personnel. The laboratory shall, at a minimum, document the chain of custody through each stage of analysis from receipt to final reporting.

## 1.08 PROJECT CONDITIONS

- A. Decontamination of Sampling Equipment: All sampling equipment shall be certified clean or precleaned, prior to collection of each sample, by the following method:
1. Wash all sampling equipment, secondary containers (e.g., mixing bowls for composite sampling) and aluminum foil with non-phosphate laboratory grade detergent and tap water.
  2. Triple rinse with tap water.
  3. Rinse with isopropyl alcohol, or if samples are visibly contaminated with petroleum use a solvent, such as hexane.
  4. Triple rinse with analyte-free water.
- B. Disposal of Decontamination Solutions: Collect all decontamination solution and dispose of it through a licensed chemical waste disposal service if it is unsuitable for treatment on-site by incorporation into existing on-site treatment processes as defined in Section 02240 - Dewatering.
- C. No stockpiling of excavated material or stripped topsoil shall be allowed on site unless a written letter of approval is obtained from the Commissioner. Contractor shall use in-situ sampling methods for all materials to be excavated or requiring sampling for characterization. The Contractor shall assume that all subsurface areas are potentially contaminated, and excavated material shall be classified as a regulated non-hazardous, industrial waste or petroleum-contaminated waste.

## 1.09 ANALYSES

- A. The services of a New York State Department of Health certified laboratory shall be engaged to perform testing and chemical analyses. The laboratory shall be acceptable to the Commissioner. Testing and Chemical analyses shall include full RCRA Characteristics, at a minimum, and the following:
1. In-Situ Soil Testing: The in-situ soil sampling and testing protocols required by the disposal facility. The analytical requirements of the disposal facilities are subject to change and it shall be the Contractor's responsibility to confirm and comply with all requirements of the chosen disposal facility.
  2. All analytical results shall be submitted to the Resident Engineer for review within 10 calendar days of date of collection. Classification of soils for disposal shall be carried out by the Resident Engineer.

## 1.10 DISPOSAL FACILITY REQUIREMENTS

- A. Non-hazardous contaminated material: The Contractor shall submit the name of the selected disposal facility and its location to the Commissioner for approval. Note that companies have numerous disposal facility locations each with differing requirements regarding types of material accepted and analytical and frequency requirements.
1. Regardless of the disposal facility chosen, the Resident Engineer will confirm the permit status, types of materials accepted, as well as check for outstanding violations and enforcement actions of the facility prior to approval.
  2. For bidding purposes, the Contractor shall verify location of the chosen facility(ies), parameters and frequencies to be tested, and types of material accepted at each facility location. The analytical and frequency requirements of these facilities are subject to change and it shall be the Contractor's responsibility to confirm and comply with all requirements of the chosen facility.
  3. The Contractor shall submit comparison tables in Excel format with highlighted exceedances for TAGM, TCLP, applicable State allowable limits, and all facility permitted limits including any alternate acceptance criteria as part of all Field Sampling Summary Reports and Disposal Facility application packages submitted to the Commissioner for review and approval.
- B. Hazardous Waste: Material found to be a characteristic hazardous waste shall be disposed of at an approved hazardous waste disposal facility.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 IN-SITU TESTING

- A. Conduct testing in accordance with the Specifications and the approved Field Sampling Plan.
- B. Field sampling shall be completed in ample time to prevent delay of the excavation work or the work of any other contractor.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 02106**  
**EX-SITU SOIL SAMPLING, TESTING AND LABORATORY ANALYSIS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary stockpiling of excavated material shall NOT be allowed on-site, unless a written letter of approval is obtained from the Commissioner. Excavated material shall NOT be used as backfill due to unsuitability of onsite soils, unless written approval is received from the Commissioner. The preferred method of characterizing soils for disposal is in-situ sampling; however, if stockpiled soils have not been previously sampled during the in-situ sampling program, ex-situ sampling shall be required prior to offsite disposal. The Contractor shall provide all labor, materials, tools, and equipment to perform all operations necessary to determine the ex-situ classification, handling and disposal requirements of soils and fill material.
- B. The Contractor shall develop and implement an Ex-situ Soil Sampling and Analysis Plan required for sampling, quality assurance, quality control (QA/QC) of work. Work includes, but is not limited to, stockpile sampling and analysis to determine if material is Hazardous Waste, Industrial Waste, Petroleum-contaminated Waste or Construction and Demolition Debris.
- C. The Contractor shall provide the services of a laboratory, certified by New York State Department of Health, to perform testing and chemical analyses.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 – Shop Drawings
- B. Section 02105 - In-situ Soil Sampling, Testing and Laboratory Analysis
- C. Section 02225 – Impacted Soil Handling
- D. Section 02371 - Dust, Soil Erosion and Sedimentation Control
- E. Section 02316 – Excavation

**1.03 REFERENCES**

- A. All references shall be in accordance with the requirements of Section 02105.

**1.04 DEFINITIONS**

- A. All definitions shall be in accordance with the requirements of Section 02105 except as modified herein.
- B. Ex-situ Soil Sampling: The number of samples required for an excavated pile will be related to the quantity of soil stockpiled. Samples shall consist of grab samples and composite samples. Samples shall be collected in accordance with the proper

sample collection techniques as detailed in the Field Sampling Plan. Samples shall be collected from within the pile. Surface soil should not be used as sampling material.

- C. Composite Sample: A composite sample is comprised of grab samples which are initially collected from within a stockpile and then combined into a single sample. This sample is representative of the entire stockpile from which the grab samples were collected.

#### 1.05 SUBMITTALS

- A. The Contractor shall provide all submittals, including the following, as specified in Section 01330 – Shop Drawings.

1. Field Sampling Plan (FSP): An FSP shall be submitted for approval 30 days following Notice to Proceed. The FSP shall include protocols for the collection and analysis of representative samples from the soil based on the receiving disposal facilities' protocols including sampling frequency and analysis requirements as described in Article 1.10. The Commissioner will approve the FSP only if it clearly provides the information to allow for classification of all material proposed for excavation. No sampling shall be conducted until the Commissioner has reviewed and formally approved the FSP in writing. The FSP shall include the following at a minimum:
  - a. A detailed outline of the disposal facility requirements. The information, including analytical requirements and sampling frequency specified by the disposal facilities shall be submitted to the Commissioner and used by the Contractor in preparing the site-specific FSP.
  - b. The FSP shall include an indication of the specific frequency of ex-situ samples per unit volume as required by the approved disposal facility chosen by the Contractor, but not fewer than one composite sample for each 500 cubic yards of material to be excavated. Parameters analyzed shall be at a minimum full RCRA Characteristics including ignitability, corrosivity, reactivity, and full Toxicity Characteristic Leachate Procedure (TCLP) for volatiles, semi-volatiles, metals, pesticides and herbicides, and PCBs, and as required by the disposal facility. This shall be done through the collection of discrete soil grab samples from within the soil stockpile. Ten (10) grab samples shall be taken from within each 500 cubic yard stockpile. Each grab sample will therefore be associated with approximately 50 cubic yards of material to be excavated. The Contractor shall note that the selected disposal facility may require more frequent sampling than that specified here. If so, the Contractor shall be required to satisfy the sampling requirements of the disposal facility.

- c. Upon collection of each grab sample, a portion of the collected soil shall be segregated for volatile analysis. The remainder of each grab sample will be homogenized and composited with the remainder of the other nine (9) discrete grab samples associated with the same 500 cubic yard portion to form one sample representative of the 500 cubic yard portion. Each representative sample shall be analyzed for parameters listed, except for volatiles. The contactor shall analyze each composite sample for PCBs also.
- d. The Contractor shall segregate approximately 12 ounces from each grab sample for volatile analysis. Fill and immediately seal one 125 ml VOA vial and place the remaining soil into a sealable plastic bag. Agitate the soil in the bag to break up the soil matrix, allow to sit for approximately 15 minutes so that the soil gases within the sample can volatilize and collect in the head space of the bag. The Contractor shall insert a photoionization detector (PID) probe inside the bag and record the organic vapor concentration. This shall be repeated for each of the 10 grab samples collected for each 500 cubic yard portion. For each 500 cubic yard portion, the discrete 125 ml sample that corresponds to the soil in the bag with the highest PID measured organic vapor concentration shall be sent to the laboratory for volatile analysis. The remaining 4 jarred samples and 5 bags of soil shall be emptied back onto the ground and the jars/bags disposed of properly. At no time shall samples to be sent for volatile analysis be homogenized.
- e. All grab samples, except for volatile analysis samples, shall be homogenized in a stainless steel bowl following EPA CLP guidelines.
- f. During excavation, the Commissioner may identify quantities within each 500 cubic yard portion that differ in appearance from the bulk of the material. In this case, the Commissioner will direct the Contractor to segregate these variable materials for stockpiling onsite.
- g. Proposed sampling, handling, preservation, and storage of equipment and procedures, including transfer procedures, and sampling equipment decontamination procedures, and manufacturer, catalog data and calibration records of all analytical equipment to be used on-site.
- h. Name and address of Analytical Laboratory, copy of laboratory certification, Quality Assurance Manual, and Standard Operating Procedures for the analyses to be performed.
- i. Analytical Methods. Proposed analytical methods shall be in accordance with SW-846, latest edition. If an SW-846 Method is not available, then EPA 600/4-79-020 shall be used.



- j. Data Quality Objectives. Procedures for assessing precision, accuracy, degree of representation, comparability and completeness of samples and data, including performance audits and proposed protocols for corrective measures where problems are identified shall be defined.
  - k. Description of QA/QC samples required by the disposal facilities.
  - l. Precise number and approximate location of samples to be collected and the specific analyses to be performed on each sample, presented in a Microsoft Excel table, and on a working drawing that is keyed to the Contract Drawings.
  - m. Description of additional disposal facility requirements.
2. Ex-situ Soil Sampling and Analysis Plan (ESSAP): The primary objective of this plan is to characterize on-site soils for transport and disposal off-site. This plan will also include QA/QC procedures and a quality management (QM) plan. The ESSAP shall address all requirements of these specifications and all requirements of New York State, EPA and OSHA and the selected disposal facility. If any conflicts arise between different agency procedures, the Commissioner will determine which method is to be used. The Contractor shall submit the ESSAP for review and approval a minimum of 30 calendar days prior to the scheduled commencement of excavation activities. No soil removal and disposal work will be allowed until all changes required by the Commissioner are made and the ESSAP is accepted in writing by the Commissioner. The ESSAP shall include at a minimum the following elements:
- a. The organizational structure of the Contractor's and all subcontractors' quality management (QM) personnel, including their:
    - (1) Names
    - (2) Resumes
    - (3) Responsibilities
    - (4) Authorities
    - (5) Qualifications
  - b. A copy of a letter signed by a responsible officer of the Contractor describing the authority and responsibilities of the Sampling and Analysis Manager
  - c. Schedule of field and laboratory inspections
  - d. Planned preparation of daily and project summary quality control reports
  - e. A statement that the sampling program is in accordance with the Contract requirements

3. Field Sampling Summary Report: The field sampling summary report shall contain all laboratory analytical results obtained from the field sampling event. A detailed account of any field procedures used which deviated from those established in the FSP shall be included, as well as a complete set of field notes. Detailed field notes shall be maintained by the Contractor during sampling to allow identification of sample analysis results with the respective stockpiles that the data represent, and to verify quantities of materials to be disposed of as hazardous waste, industrial waste, petroleum-contaminated waste or C&D debris. The field notes shall be made available to the Commissioner during the sampling program, and shall consist of:
  - a. A map showing which samples are associated with which stockpile, and where individual grab samples were collected within the stockpile. If multiple composite samples are collected from one stockpile, the map should provide sufficient detail to ensure that the specific area represented by each individual composite sample can be distinguished, if necessary.
  - b. Whether each sample is a grab or composite, and any special notes, which are included on the laboratory chain-of-custody forms.
  - c. Copies of all laboratory chain-of-custody forms for samples that are collected for analysis.
4. Analytical Results: Contractor shall submit analytical results for sampled soil material to the Commissioner within 3 calendar days of receipt of such data from the laboratory.

#### 1.06 QUALITY ASSURANCE

- A. All quality assurance requirements shall be in accordance with the requirements of Section 02105 – In-Situ Soil Sampling, Testing and Laboratory Analysis.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. All delivery, storage and handling requirements shall be in accordance with the requirements of Section 02105 – In-Situ Soil Sampling, Testing and Laboratory Analysis.

#### 1.08 PROJECT CONDITIONS

- A. All project conditions shall be in accordance with the requirements of Section 02105 – In-Situ Soil Sampling, Testing and Laboratory Analysis.

1.09 ANALYSES

- A. All analytical requirements shall be in accordance with the requirements of Section 02105 – In-Situ Soil Sampling, Testing and Laboratory Analysis.

1.10 DISPOSAL FACILITY REQUIREMENTS

- A. All disposal facility requirements shall be in accordance with the requirements of Section 02105 – In-Situ Soil Sampling, Testing and Laboratory Analysis.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 EX-SITU TESTING

- A. Conduct testing in accordance with this Section and the approved Field Sampling Plan.
- B. Ex-situ sampling shall be completed in ample time to prevent delay of the excavation work.

-END OF SECTION-

**Section 02222**  
**DEMOLITION AND REMOVALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to complete the demolition and removals work and properly dispose of all demolition and removals waste materials from the site.
- B. Included, without limitation, are demolition and removals of existing materials, structures, equipment, and other work necessary to install the new Work as shown and specified and to connect the same with existing work to remain in an approved manner. Demolition and removals include existing marine piles, structural concrete, foundations, walls, doors, windows, structural steel, metals, roofs, masonry, attachments, appurtenances, piping, utilities, electrical and mechanical equipment, paving, curbs, walks, fencing, and similar existing facilities.
- C. Demolition and removals that may be specified under other Sections shall conform to requirements of this Section.
- D. The removal of all equipment, piping, pumps, and all other materials from the demolition of buildings and structures shall, when released by the Commissioner, become Contractor's property, unless otherwise noted. These materials and debris shall be disposed of off-site as required by the Contract Documents.
- E. Contractor shall obtain all required permits for the demolition and removals work from the City and other agencies having jurisdiction.
- F. Contractor is responsible for the transportation, handling, removal and proper disposal of regulated solid and hazardous wastes.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 - Regulated Materials Control
- B. Section 01733 - Construction Waste Management
- C. Section 02224 - Removal of Arsenic Impacted Wood - Environmental Requirements
- D. Section 02225 - Impacted Soil Handling
- E. Section 02291 - Air Monitoring Program

- F. Section 02316 - Excavation
- G. Section 02371 - Dust, Soil Erosion and Sedimentation Control
- H. Section 13287 - Environmental Waste Transportation and Disposition

#### 1.03 REFERENCES

- A. Reference Standards: Regarding closure of underground storage tanks, Contractor shall comply with the applicable provisions and recommendations of the following, unless otherwise shown or specified.
  - 1. 29 CFR 1518 - Safety and Health Regulations for Construction
  - 2. 29 CFR 1910 - Occupational Safety and Health Standards
  - 3. ANSI A10.2 - Safety Code for Building Construction
  - 4. AWS D12.1 - Reinforcing Steel Welding Code

#### 1.04 SUBMITTALS

- A. Provide all submittals in accordance with Section 01330 - Shop Drawings.
- B. Working drawings and shop drawings shall include, but not be limited to proposed methods, equipment and operating sequences to be used in performance of the demolition and removals work.

#### 1.05 JOB CONDITIONS

- A. Protection
  - 1. Demolition and removals work shall be performed by competent workmen experienced in the various types of demolition and removals work required, and it shall be carried through to completion with the prevention of damage or injury to structures and facilities to remain, City employees, workers on the site, the public and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use of, and free and safe passage to and from, adjacent structures and facilities.
  - 2. Contractor shall provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, workers engaged in demolition operations, and adjacent construction.
  - 3. Contractor shall provide and maintain temporary protection of existing structures and facilities designated to remain where demolition and removals work is being done, connections made, materials handled or equipment moved. Contractor shall be responsible for any damage to such existing

structures and facilities to remain or contents by reason of providing insufficient protection.

4. Contractor shall take necessary precautions to control dust as required by Section 02371 - Dust, Soil Erosion and Sedimentation Control. Dust shall be prevented from rising by wetting demolished masonry, concrete, plaster and similar debris, as applicable.
  5. Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.
  6. Contractor shall be solely responsible for making all necessary arrangements and for performing all necessary work involving the discontinuance or interruption of all utilities or services.
  7. Closing or obstructing of roadways, sidewalks, and passageways adjacent to the Work by the placement or storage of materials will not be permitted, and all operations shall be conducted with minimum interference to traffic.
  8. Contractor shall repair damage caused by its operations to facilities to remain, or to any property belonging to the City.
  9. The work shall comply with the applicable provisions and recommendations of ANSI A10.2, Safety Code for Building Construction, all governing codes and as specified in Division 1.
  10. Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removals.
  11. Demolition and removal of hazardous materials shall be in accordance with applicable Federal, State and Local regulations and Sections 01355 - Regulated Materials Control, 02223 - Demolition of Building Components Coated with Lead and Cadmium Containing Paint - Environmental Requirements and 02224 - Removal of Arsenic Impacted Wood - Environmental Requirements. See Division 13 specifications regarding environmental remediation work to be carried out prior to commencement of the demolition and removals work.
  12. Handling and disposal of waste demolition and removals materials shall conform to requirements of Section 01733 - Construction Waste Management or Section 13287 - Environmental Waste Transportation and Disposition, as applicable.
- B. Permits: Obtain all permits required for closing or obstructing streets and sidewalks.

**C. Condition of Buildings, Structures and Equipment**

1. The City does not assume responsibility for the actual condition of buildings, structures and equipment to be demolished and removed.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the City so far as practicable. However, there is no guarantee by the City that the number of fixtures, amount of equipment or any other material of value existing at bidding time in the buildings and structures to be demolished will be present in the structures when they are demolished. Contractor shall have no claim against the City because of the absence of such fixtures and materials.
3. The information regarding the existing structures and equipment shown on the Contract Drawings is based on a compilation of past project drawings, visual inspections and a walk-through survey. Neither the Commissioner nor the City will be responsible for interpretations or conclusions drawn therefrom by Contractor.

- D. Notification: At least 48 hours prior to commencement of demolition and removals, Contractor shall notify the Resident Engineer in writing of its proposed schedule. The City of New York will inspect the existing equipment or facilities and review with the Contractor those items that are to remain the property of the City of New York. No demolition or removals shall be started without the permission of the Commissioner.

- E. The use of explosives will not be permitted.

**PART 2 PRODUCTS (Not Used)****PART 3 EXECUTION****3.01 GENERAL**

- A. The work required shall be performed with care, and shall include all necessary shoring, bracing, and support to prevent movement, settlement, or collapse of existing structures or facilities. Contractor shall be responsible for any damage that may be caused by demolition and removal work to any part or parts of existing structures or items designated for reuse or to remain, and shall repair the same at no additional costs to the City.
- B. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with Section 02371 - Dust, Soil Erosion and Sedimentation Control and all governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
  2. Clean adjacent structures, facilities, existing facilities to remain and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work unless otherwise shown, specified or required.
  3. The use of calcium chloride for dust control will not be allowed.
- C. Any materials or items designated to remain the property of the City of New York shall be removed with care and stored at locations designated by the City of New York.
- D. Where equipment is shown or specified to be removed and relocated, Contractor shall not proceed with removal of this equipment without specific prior approval of the Commissioner. Upon approval, and prior to commencing removal operations, the equipment shall be operated in the presence of representatives of Contractor and the Commissioner. Such items shall be removed with care and shall be protected and stored until required. Material or equipment damaged during removal shall be replaced with similar new material or equipment. Any equipment that is removed without proper authorization shall be replaced at no cost to the City of New York.
- E. Wherever piping is to be removed for disposal, the piping shall be drained by Contractor, and adjacent pipe and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.
- F. Where alterations occur, or new and old work join, Contractor shall cut, remove, patch, repair or refinish the adjacent surfaces to the extent required by the construction conditions, so as to leave the altered work in as good a condition as existed prior to the start of the work. The materials and workmanship employed in the alterations shall be of the same quality as required for new work of the same type.
- G. Contractor shall remove temporary work, such as enclosures, signs, guards, and the like when such temporary work is no longer required or when directed at the completion of the work.
- H. Contractor shall dispose of all demolition materials, equipment debris, and all other items not marked or specified by the City of New York to remain as property of the City of New York, off site and in conformance with all existing applicable laws and regulations.
- I. Backfill to grade all open areas caused as a result of the demolition except for areas where new Work will proceed within 30 days and the nature of the new Work dictates otherwise.



**J. Building Demolition**

1. Break up and remove foundations and slabs-on-grade, unless otherwise shown to remain.
2. Locate equipment used for demolition work, and remove demolished materials, so as not to impose excessive loads on structures and facilities to remain.
3. Regrade in accordance with Section 02316 - Excavation, where appropriate.

**3.02 STRUCTURAL REMOVALS**

- A. Contractor shall remove existing marine piles, foundations, concrete, structures and sub-structures to the lines and grades shown or noted unless otherwise directed by the Commissioner. Where no limits are shown or noted, the limits shall be 4 feet below final finished grade or 2 feet below underside of structure, unless otherwise approved by the Commissioner. The removal and replacement of materials beyond these limits shall be at Contractor's expense.
- B. Determine the thickness of existing concrete to be removed and the extent to which it is reinforced. No additional compensation will be made because of variations from the thickness shown or for variations in the amount of reinforcement.
- C. All concrete, stone, masonry, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure shall be removed and taken from the site and disposed of at a permitted facility. Demolished items shall not be used in backfill.

**3.03 MECHANICAL REMOVALS**

- A. Mechanical removals shall consist of dismantling and removing existing pipes, pumps, motors and other facilities as specified, shown, or required for the completion of the work. It shall include cutting, capping, draining, and plugging as required, except that the cutting of existing piping for the purpose of making connections thereto will be included under Division 15 of the Specifications.
- B. Existing process, water, chemical, and other piping shall be removed and capped where shown on the Contract Drawings. Piping shall be purged and made safe by the Contractor prior to removal or capping. Disposal of any chemicals or other purged material shall be the responsibility of the Contractor. Where piping that is to be removed passes through existing walls, it shall be cut off and properly capped on each side of the wall.
- C. When underground piping is to be altered or removed, the remaining piping shall be properly capped. Abandoned underground piping may be left in place unless it interferes with new work or is shown or specified to be removed.

- D. Any required demolition or changes to potable water piping and other plumbing system work shall be made in conformance with all applicable codes. Portions of the potable water system that may have been altered or opened shall be pressure tested and disinfected in accordance with the Specifications for Division 15 and local codes.
- E. Provide all caps, plugs, blind flanges, shut-off valves and other work and materials required to remove from service existing piping and necessary to keep existing piping in service where shown or required.

### 3.04 PAVEMENT, CURB AND SIDEWALK REMOVALS

- A. Remove existing pavement, including base and surface courses, stabilized sub-bases, curbs, and gutters as required to construct new facilities or as shown. When removing sections next to sections that are to remain, sawcut the full depth of the concrete and asphalt. Cut pavements, curbs and sidewalks with non-impact tools or other equipment approved by the Commissioner. Breaking of pavements, curbs and sidewalks by impact, such as with the use of a ball, is not permitted. Curbs and gutters shall be removed to the nearest construction joint beyond the limit of demolition shown on the Drawings.
- B. Provide for satisfactory transition between replaced pavement and sidewalks and the portions remaining in place.

### 3.05 ELECTRICAL REMOVALS

- A. Electrical removals shall consist of the removal of existing generators, transformers, distribution switchboards, control panels, motors, conduits and wires, and miscellaneous electrical equipment all as shown, specified, or required to perform the work.
- B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to maintain the integrity of the grounding systems.
- C. Motors shall be disconnected and removed where shown or specified. Motors not marked or designated by the City of New York to be salvaged shall be removed from the site. Motors or other electrical gear designated for reuse shall be stored in enclosed, heated storage.
- D. Conduits and wires shall be abandoned or removed where shown.
- E. Electrical Contractor is responsible for de-energizing the existing electrical service.

### 3.06 MISCELLANEOUS REMOVALS

- A. Contractor shall remove miscellaneous items where shown on the Contract Drawings or where necessary for the construction of new structures or modification of existing structures.

### 3.07 MODIFICATIONS AND CLOSURES

- A. Modifications shall conform with all applicable Specifications, Contract Drawings, and the directions and approvals of the Commissioner.
- B. Where alterations require cutting or drilling into existing floors, walls, and roofs, the holes shall be repaired in an approved manner. Contractor shall repair such openings with the same or matching materials as the existing floor, wall, or roof, or as otherwise approved by the Commissioner. All repairs shall be smoothly finished unless otherwise approved by the Commissioner.
- C. Openings in existing concrete slabs, ceilings, roofs, masonry walls, floors and partitions which are not to be used in the new work shall be closed and sealed as shown or otherwise directed by the Commissioner.
- D. Where parts of existing structures are to remain in service, demolish the portions to be removed, repair damage, and leave the structure in proper condition for the intended use. Remove concrete and masonry to the lines designated by drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp straight corners that will result in neat joints with new construction or be satisfactory for the purpose intended. Where existing reinforcing rods are to extend into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing flush with the surface.
- E. New work shall be keyed into the existing in an acceptable manner. New reinforcing steel shall be welded to the existing reinforcing. Welding shall conform to AWS D12.1, Reinforcing Steel Welding Code. In general, the same or matching materials as the existing adjacent surface shall be used. The finished closure shall be a smooth, tight, sealed, permanent closure with all exposed surfaces smooth finished and acceptable to the Commissioner.

### 3.08 MAINTENANCE AND CLEAN UP

- A. Contractor shall maintain all buildings, structures, and other City properties free from accumulations of waste, debris, and rubbish caused by the demolition and removal operations.
- B. Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish, and shall wet down dry materials to prevent blowing dust.

- C. At reasonable intervals during the progress of the demolition and removal work or as directed by the Commissioner, Contractor shall clean the Site and dispose of waste materials, debris, and rubbish.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 02224**  
**REMOVAL OF ARSENIC-IMPACTED WOOD - ENVIRONMENTAL**  
**REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for removal and handling of wood that failed the Toxicity Characteristic Leaching Procedure (TCLP) test for arsenic.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 – Regulated Materials Control
- B. Section 01356 – Safe and Healthful Working Conditions
- C. Section 02222 – Demolition and Removals
- D. Section 02291 – Air Monitoring Program

**1.03 PAYMENT**

- A. The cost for all work described in this section shall be included in the Contractor's lump sum bid price for Bid Item 1, except as indicated in Paragraph B below.
- B. In the event that wood materials of the existing fendering system fail the TCLP test for arsenic, the additional costs incurred for removing, handling and disposal of such wood materials shall be paid out of the Hazardous Materials Remediation allowance as described in Section 01355 – Regulated Materials Control.

**1.04 DEFINITIONS**

- A. Arsenic-impacted wood shall be defined as wood that failed the TCLP test for arsenic (i.e., arsenic was detected in leachate extracted from a wood sample at a concentration equal to or greater than 5 milligrams per liter [mg/L]).

**1.05 WORK SPECIFIED**

- A. The Contractor shall provide all training, labor, equipment, materials, and services necessary to comply with the environmental and worker protection requirements during removal and handling of arsenic-impacted wood, as required by applicable laws and regulations and as specified in this Section.
- B. The Contractor shall prepare and submit a written compliance program as required in Article 1.06 of this Section.

## 1.06 SUBMITTALS

- A. At least 90 calendar days prior to the commencement of the arsenic-impacted wood removal and handling work, the Contractor shall submit the following items in accordance with the requirements specified in Section 01355 – Regulated Materials Control:
1. Written compliance program prepared in accordance with 29 CFR Part 1910.1018(g) and 1926.1118(g).
  2. The names of all proposed subcontractors to be used on the project, including their qualifications, locations of origin, and descriptions of their project assignments.
  3. A list of equipment and materials to be used for the removal and handling of arsenic-impacted wood, along with the catalog sheets.
  4. A description of engineering controls, physical barriers, and other measures that the Contractor proposes to use to mitigate the discharge of dust or other material from the work area and to prevent the release of arsenic-impacted wood and/or sawdust or other material to adjacent water bodies.
- B. Within 2 weeks of completion of the arsenic-impacted wood removal and handling, the Contractor shall submit the following in accordance with the requirements specified in Section 01355 – Regulated Materials Control:
1. Copies of all project records, as required under 29 CFR 1910.1018(q).

## 1.07 QUALIFICATIONS

- A. All onsite personnel directly involved in removal and/or handling of arsenic-impacted wood (or wood assumed to be arsenic-impacted, as required in this Section) must have Occupational Safety and Health Administration (OSHA) 40-hour hazardous waste training (29 CFR 1910.120 and 1926.65) and the corresponding 8-hour refresher course update.

## 1.08 EXISTING CONDITIONS

- A. Wood samples collected from wooden components of the Southwest Brooklyn Marine Transfer Station fendering system located along the bulkhead were not sampled for arsenic.
- B. Due to access limitations wood piles, framework, fendering system components and bracing materials located along the bulkhead were not sampled or analyzed for Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics. In order to determine proper disposal requirements for wood piles, framework,

fendering system components and bracing located along the bulkhead, these components shall be sampled and analyzed by the Contractor.

- C. For bidding purposes, the Contractor shall assume that the wood materials located below the transfer station's barge slip floor level do not fail the TCLP test for arsenic and will not require removal, handling, and disposal in accordance with this Section. This assumption is for bidding purposes only: actual handling and disposal shall be performed in the manner required by the results of the sampling and analysis.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 ARSENIC-IMPACTED WOOD REMOVAL

- A. The Contractor shall implement a written compliance program (to be prepared by the Contractor) in accordance with Paragraph 1.06A.1 above.
- B. The Contractor shall assume that these materials (all wooden framework, bracing, and pile components) are arsenic-impacted and are subject to the requirements specified in this Section, until and unless the laboratory analytical results indicate otherwise.
- C. At the Contractor's discretion, the Contractor may elect to adjourn the removal/demolition of the wood components currently located along the bulkhead until the wood sampling analytical results are available, and then proceed with the removal/demolition activities as warranted based on the analytical results (e.g., address the wood components located below the barge slip floor level as "arsenic-impacted" or "non-arsenic-impacted," as appropriate), or the Contractor may perform the removal/demolition of these wood components prior to receipt of the wood sampling analytical results, subject to the provisions of this Section. If the Contractor elects to remove/demolish currently uncharacterized wood components located along the bulkhead prior to receipt of the wood sampling laboratory analytical results, such removal/demolition shall be conducted as if the wood is arsenic-impacted and in accordance with the requirements of this Section and at the Contractor's sole risk. Payment for removal, handling, and disposal of the currently uncharacterized wood as "arsenic-impacted" will be made to the Contractor only if the laboratory analytical results for the wood samples indicate that the wood sample(s) failed the TCLP test for arsenic. No payments under the Hazardous Material Remediation allowance will be made if the wood samples do not fail the TCLP test for arsenic.
- D. The Contractor shall conduct the arsenic-impacted wood removal and handling activities in a manner that minimizes generation of airborne dust and/or sawdust (e.g., saws, if used, shall be equipped with dust collection devices, such as high-



efficiency particulate air [HEPA] filtered vacuum attachments). Additional dust control requirements are presented in Article 3.02 of this Section.

- E. Following completion of the arsenic-impacted wood removal activities, the remaining surfaces that contain sawdust and/or remnant pieces of wood debris shall be cleaned to the satisfaction of the Resident Engineer. The cleaning shall be accomplished by vacuuming the surfaces with vacuums equipped with HEPA filters. Shoveling and brushing may be used, in a manner that does not generate dust, only where vacuuming has been tried and found not to be effective (based on the Resident Engineer's judgment). The use of compressed air for cleaning purposes will not be allowed. Remnant pieces of wood and sawdust shall be placed into United States Department of Transportation- (USDOT-) approved containers for subsequent transportation and offsite disposal.
- F. All used disposable equipment, including disposable clothing, filters, polyethylene sheeting, etc., that contacts the arsenic-impacted wood debris shall be collected and placed into USDOT-approved containers for subsequent transportation and offsite disposal with the arsenic-impacted wood debris.
- G. The Contractor shall implement engineering controls, as necessary, to mitigate the discharge of dust or other material from the work areas and prevent the release of arsenic-impacted wood debris, sawdust, or other material to adjacent water bodies and outside the work area. The engineering controls may include, but are not limited to, installation of tarps, barriers, etc.

### 3.02 DUST CONTROL

- A. If the Contractor elects to use vacuum equipment, the vacuum equipment shall be equipped with a HEPA filtration system.
- B. Air monitoring and fugitive dust suppression activities shall be performed in accordance with applicable regulations and provisions specified in Section 02291 – Air Monitoring Program. If any of the particulate action level concentrations specified in Section 02291 – Air Monitoring Program are exceeded, the Contractor shall immediately undertake appropriate action to reduce the concentration of airborne dust to the acceptable level specified in Section 02291.
- C. In addition to the requirements of Paragraph 3.02B of this Section, if a significant amount of visible dust is generated during the demolition, removal, and/or handling of arsenic-impacted wood (based on the Resident Engineer's judgment), the Contractor shall take all appropriate measures to reduce the concentration of airborne dust to the satisfaction of the Resident Engineer.
- D. All dust and debris generated during the dust control activities shall be placed into USDOT-approved containers for subsequent transportation and off-site disposal.

3.03 HEALTH AND SAFETY PROTOCOLS

- A. The Contractor shall comply with all applicable federal, state, and local regulations (including, but not limited to, OSHA regulations) during the implementation of the work. The work described in this Section shall be conducted in accordance with the Contractor's site-specific health and safety plan, which is described Section 01356 – Safe and Healthful Working Conditions.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 02225**  
**IMPACTED SOIL HANDLING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for identifying, classifying, handling, and staging of impacted soil generated as a result of demolition and construction activities.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 - Regulated Materials Control
- B. Section 01356 - Safe and Healthful Working Conditions
- C. Section 02105 - In-situ Soil Sampling, Testing and Laboratory Analysis
- D. Section 02106 - Ex-situ Soil Sampling, Testing and Laboratory Analysis
- E. Section 02240 - Dewatering
- F. Section 02291 - Air Monitoring Program
- G. Section 02316 - Excavation
- H. Section 02317 - Backfilling
- I. Section 02360 - Excavation Support and Protection
- J. Section 02371 - Dust, Soil Erosion and Sedimentation Control
- K. Section 13287 - Environmental Waste Transportation and Disposition

**1.03 PAYMENT**

- A. All costs for work specified in this Section shall be included in the lump sum bid for Bid Items 1, 2 and 3, except as described below in Part 1.03.B
- B. Additional costs for handling, transportation and disposal of soils classified as unforeseen soil conditions as described in Part 3.02 below shall be paid for out of the Hazardous Materials Allowance subject to the requirements of Section 01355 – Regulated Materials Control.

**1.04 DEFINITIONS**

- A. Impacted soil – Soil that meets one or more of the following criteria:
  - 1. Soil containing constituents at concentrations greater than their respective numerical values for protection of human health and water quality presented in New York State Department of Environmental Conservation's (NYSDEC's) document entitled, *Technical and Administrative Guidance Memorandum (TAGM) 4046: Determination of Soil Cleanup Objectives and Cleanup Levels*;

2. Soil identified as "impacted" in the Supplemental Environmental Information Package (SEIP). The SEIP is provided for informational purposes only and is not part of the Contract;
  3. Soil impacted by oil or otherwise grossly impacted (e.g., staining, sheens, odors, elevated photoionization detector [PID] readings, etc.), as determined by the Commissioner at his/her sole discretion; and
  4. Soil identified by the Contractor to be impacted based on the protocol presented in Section 01355 – Regulated Materials Control, and/or as defined in this or other applicable Sections.
- B. All excavated soil shall be classified as impacted soil, unless otherwise specified or directed by the Commissioner.

#### 1.05 WORK SPECIFIED

- A. The Contractor shall provide all labor, equipment, materials, and services necessary for identifying, classifying, handling, and staging of impacted soil present at the work site.

#### 1.06 SUBMITTALS

- A. At least 30 calendar days prior to the commencement of the impacted soil handling work, the Contractor shall submit the following items for review in accordance with the requirements specified in Section 01355 – Regulated Materials Control:
1. Impacted Soil Excavation Plan containing the Contractor-proposed procedures for handling and staging impacted soil.
  2. A description of proposed impacted soil staging areas.

### PART 2 PRODUCTS (Not Used)

### PART 3 EXECUTION

#### 3.01 SOIL CLASSIFICATIONS

- A. Nonhazardous Suitable Soil – Impacted soil (as defined in Paragraph 1.04A of this Section) that meets the requirements for one or more of the backfill material categories (i.e., drainage fill, select fill, etc.) presented in Section 02317 – Backfilling. If screening and/or crushing is required to meet the backfill material category requirements, the soil shall be deemed unsuitable soil.

B. Nonhazardous Unsuitable Soil – Contains either of the following:

1. Does not meet the backfill material category (i.e., drainage fill, select fill, etc.) requirements presented in Section 02317 – Backfilling.
2. Impacted by oil or otherwise grossly impacted (e.g., sheens, odors, elevated PID readings) as determined by the Commissioner.

C. Hazardous Material – Meets one or more of the criteria for determination of a hazardous waste presented in Part 371 of Title 6 of New York Codes, Rules, and Regulations (6 NYCRR Part 371) and Part 261 of Title 40 of the Code of Federal Regulations (40 CFR 261).

D. The Contractor shall assume that all soil requiring excavation is impacted and meets the description set forth in Paragraphs 3.01A and 3.01B.1 of this Section.

3.02 UNFORESEEN SOIL CONDITIONS

A. Impacted soil that meets the description set forth in Paragraphs 3.01B.2 and 3.01C of this Section (e.g., is impacted by oil or otherwise grossly impacted [e.g., sheens, odors, elevated PID readings] or is hazardous) shall be characterized and handled in accordance with Section 01355 – Regulated Materials Control.

B. The Contractor shall notify the Commissioner if unforeseen soil conditions are encountered.

3.03 WASTE HANDLING, STAGING, AND DISPOSAL

A. Handling and Staging

1. Impacted soil shall be segregated into the three soil classifications listed in Article 3.01 of this Section.
2. Excavated material shall be characterized for transportation and disposal in accordance with the following:
  - a. Section 02105 and Section 02106;
  - b. Applicable federal, state, and local regulations and permits; and
  - c. Paragraph 3.03C of this Section
3. Moving impacted soil off of the project site (except for disposal at a reviewed facility) is strictly prohibited unless authorized by the Commissioner.
4. In accordance with Section 02106, temporary stockpiling of excavated material shall NOT be allowed on-site, unless a written letter of approval is obtained from the Commissioner. If a letter of approval is granted, comply with the requirements below.

The Contractor shall construct an onsite soil staging area(s) to properly contain impacted soil until receipt of waste characterization and transportation for off-site disposal. The soil staging area(s) shall be of suitable size to contain the anticipated quantities of soil generated during construction activities. The soil staging area(s) shall be placed within the construction limits of the Project, at designated areas as established by the Contractor prior to construction and reviewed and approved by the Commissioner. The soil staging area(s) shall be constructed to meet the following minimum requirements:

- a. The impacted soil shall be placed by the Contractor onto an impermeable liner (e.g., 40-mil high density polyethylene [HDPE]) that is of sufficient strength and thickness to prevent puncture during use. The placement of impacted soils into the staging area shall be performed such that it does not involve any equipment or procedures that may jeopardize the integrity of the underlying impermeable liner.
- b. An 18-inch high gravel berm shall be constructed around the perimeter of the staging area to provide for containment of liquids that have drained from the impacted soils, and to divert runoff around the staging area. The impermeable liner shall be placed within and extend up and over the berm and shall be anchored beyond the outside perimeter of the berm to prevent displacement. Soil or other waste materials shall not be utilized to anchor the cover.
- c. The staging area shall be sloped (where practical) and equipped with a sump (if possible based upon site conditions) to collect liquids that have drained from the impacted soils or resulting from a precipitation event. The Contractor shall pump all liquids that accumulate within the staging area to a Contractor-provided temporary storage tank(s). Following collection, liquids shall be containerized by the Contractor and disposed of in accordance with the requirements of Section 02240 – Dewatering.
- d. The staging area shall be continuously covered with 10-mil polyethylene sheeting, except while soils are being actively placed within or removed from the staging area. The polyethylene sheeting shall be maintained watertight by the Contractor for the duration of the soil staging activities and shall be securely anchored to prevent displacement.
- e. The Contractor shall inspect the staging area(s) daily and shall promptly correct any deficiencies.
- f. Impacted soil located in the staging area shall not exceed 8 feet in height unless authorized by the Commissioner.
- g. Impacted soil located in the staging area shall be protected by the use of erosion and sediment control features, including silt fencing, in

accordance with Section 02371 – Dust, Soil Erosion and Sedimentation Control. Such features shall be removed and disposed of appropriately at the end of construction.

- B. Soil Reuse: The Contractor shall not reuse soil for on-site backfill or for any other on-site use. The Contractor shall not reuse soil off-site.
- C. Transportation and Disposal: Soil shall be transported and disposed of in accordance with Section 13287 – Environmental Waste Transportation and Disposal and all current applicable federal, state, and local regulations and permits.

### 3.04 EXCAVATION DEWATERING

- A. The Contractor shall remove water that accumulates within active excavation areas to assist in dewatering soil and to facilitate implementation of the soil excavation activities. All water collected as a result of dewatering activities shall be collected, containerized, and handled in accordance with Section 02240 – Dewatering.

### 3.05 DECONTAMINATION OF EQUIPMENT

- A. The Contractor shall perform decontamination of equipment that comes in contact with impacted soil in accordance with the following:
  - 1. The Contractor shall provide a personnel decontamination area as specified in the Contractor's Health and Safety Plan (HASP).
  - 2. Equipment decontamination shall be in accordance with provisions specified in Section 01355 – Regulated Materials Control and Section 02371 – Dust, Soil Erosion and Sedimentation Control.
  - 3. The equipment decontamination area shall be placed within the contamination reduction zone as identified in the Contractor's HASP. Precautions shall be taken to limit contact between the equipment, decontamination personnel, and any cleaning liquids that may accumulate in the decontamination area.
  - 4. The Contractor shall dismantle and properly dispose of all materials associated with the equipment decontamination area and shall restore the area to its original conditions, and as required by the new transfer station construction design requirements at the end of construction.
  - 5. Wash water generated as a result of equipment decontamination activities shall be collected, containerized, and handled in accordance with Section 02240 – Dewatering.
  - 6. Solids and other materials generated during equipment decontamination shall not contact native soils and existing facilities, and shall be collected,



characterized, and disposed of by the Contractor in accordance with Section 13287 – Environmental Waste Transportation and Disposal.

7. Personnel engaged in equipment decontamination activities shall use personal protective equipment (PPE) in accordance with the Contractor's HASP.

### 3.06 AIR SAMPLING

- A. The Contractor shall conduct air monitoring in accordance with Section 02291 – Air Monitoring Program, Section 01356 – Safe and Healthful Working Conditions, and the Contractor's HASP.
- B. The Commissioner will conduct perimeter air monitoring in accordance with Section 02291 – Air Monitoring Program.

### 3.07 HEALTH AND SAFETY PROTOCOLS

- A. The Contractor shall comply with all applicable federal, state, and local regulations, including, but not limited to, Occupational Safety and Health Administration regulations, during the implementation of the work. The work described in this Section shall be conducted in accordance with the Contractor's site-specific HASP, which is described in Section 01356 – Safe and Healthful Working Conditions

-END OF SECTION-

**Section 02230  
SITE CLEARING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, tools, equipment, materials and incidental items required to perform site clearing and grubbing of areas within the limits of construction and other areas shown on the Contract Drawings, including work designated in permits and other agreements, in accordance with the requirements of Division 1.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 02371 - Dust, Soil Erosion and Sedimentation Control

**1.03 DEFINITIONS**

- A. Clearing: Clearing is the removal from the ground surface and disposal of trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish, trash, scrap, metal, debris and miscellaneous other structures required to permit construction of the new Work.
- B. Grubbing: Grubbing is the removal and disposal of all stumps, buried logs, roots larger than 2 inches, matted roots and organic materials.

**1.04 QUALITY ASSURANCE**

- A. Codes and Standards: State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

**1.05 PROJECT/SITE CONDITIONS**

- A. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. Contractor shall return to original condition, satisfactory to the Commissioner, facilities damaged by the Contractor's operations.

**1.06 GUARANTEE**

- A. The Contractor shall guarantee that work performed under this Section will not permanently damage trees, shrubs, turf or plants to remain, or other adjacent work or facilities. If damage resulting from Contractor's operations appears during the

period up to 12 months after completion of the project, he shall replace damaged items at no expense to the City.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 TREE AND SHRUB REMOVAL

#### A. Tree Removal Within Property Limits

1. Trees and shrubs within the limits of construction shall be removed unless otherwise indicated. Trees and shrubs to remain shall be trimmed when doing so will avoid removal or damage. Trimmed or damaged trees shall be treated and repaired by persons with experience in this specialty who are approved by the Commissioner.
2. Tree and shrub removal shall be conducted in a manner so as to avoid damage to those trees and shrubs that will remain.
3. Do not cut or damage trees or shrubs outside of the limits of construction. Damage outside the limits of construction, caused by the Contractor's operations, shall be corrected at the Contractor's expense.

- B. Tree Removal Outside Property Limits: The Contractor shall not cut or damage trees outside the property limits unless shown on the Contract Drawings to be removed or unless written permission has been obtained from the property owner. Furnish three copies of the written permission before removal operations commence. Damage outside the property limits caused by the Contractor's operations shall be corrected at the Contractor's expense.

### 3.02 CLEARING AND GRUBBING

- A. Clearing: The Contractor shall clear all items specified to the limits of construction shown by the Contract Drawings and shall remove cleared and grubbed materials from the site to an authorized disposal site.
1. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.
  2. Comply with erosion, sediment control and storm management measures as specified in Section 02371 - Dust, Soil Erosion and Sedimentation Control.

- B. Grubbing: The Contractor shall clear and grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.
  - 1. Stumps and root mats in these areas shall be removed to a depth of not less than 1 foot below the subgrade of sloped surfaces.
  - 2. All depressions made by the removal of stumps or roots shall be filled with material suitable for backfill as specified in Section 02317 - Backfilling.
- C. Limited Clearing: The Contractor shall clear areas receiving more than 3 feet of fill by cutting trees and shrubs as close as practical to the existing ground. Grubbing will not be required.
- D. Burning
  - 1. Burning of cleared and grubbed materials is not allowed within the property limits.
  - 2. All burning off-site shall be in complete accordance with rules and regulations of local authorities having jurisdiction.
- E. Explosives shall not be used.
- F. No cleared or grubbed material may be used in backfills or structural embankments.
- G. Cleared and grubbed items shall become property of the Contractor and shall be removed from the site and satisfactorily disposed.
- H. Air pollution caused by dust and dirt shall be controlled, complying with governing regulations. Dust control shall be as specified in Section 02371 - Dust, Soil Erosion and Sedimentation Control.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 02240  
DEWATERING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall furnish, install, operate and maintain dewatering equipment and systems as shown, specified and required.
- B. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.
- C. The Contractor shall install, measure, record and report water levels in groundwater observation wells.
- D. The Contractor shall obtain all necessary permits from State and local agencies for operation of the dewatering system and disposal of the dewatering effluent.
- E. The Contractor shall provide a Dewatering Sampling and Analysis Plan (DSAP) and arrange for the services of a New York State certified laboratory, for the collection and analyses of dewatering effluent to determine the quality of dewatering effluent prior to disposal.
- F. The Contractor shall dispose of dewatering effluent as specified herein.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02225 - Impacted Soil Handling
- B. Section 02316 - Excavation

**1.03 REFERENCES**

- A. State of New York DEC General Discharge Permit
- B. State of New York DEC Long Island Well Permit
- C. NYC DEP Division of Pollution Prevention and Control
- D. NYC DEP Division of Connections and Permitting
- E. New York City Construction Codes
- F. ASTM standards applicable to piping, equipment and other items required for a complete dewatering system

## 1.04 DEFINITIONS

- A. Dewatering System: System of wells, well points, sumps, ejectors, pumps, power supply, effluent treatment equipment and other equipment designed by Contractor, submitted to and approved by the Commissioner prior to dewatering, that will effectively dewater the site as required. Adequate observation wells shall be included in the dewatering system to verify drawdown levels inside the excavation area and monitor groundwater levels outside the limits of the excavation near adjacent structures.
- B. Construction Dewatering: Controlling groundwater levels, hydrostatic pressures and controlling surface water, such that excavation required on the Contract Drawings can be performed to required depths in substantially dry and stable conditions.

## 1.05 SUBMITTALS

- A. Provide all submittals in accordance with Section 01330 - Shop Drawings.
  - 1. Pre-construction Submittals: Approval of the dewatering system by the Commissioner shall not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance of the dewatering system to provide the necessary construction dewatering. A Dewatering Excavation Plan shall be submitted to the Commissioner and the NYSDEC at least 30 calendar days prior to the commencement of the dewatering work and, at a minimum, shall include the following:
    - a. Design calculations demonstrating the adequacy of the proposed dewatering system, including depth to groundwater at excavation limits.
    - b. Calculations and requisite technical data on well screens and filter materials and gradations to demonstrate the adequacy of proposed systems to prevent the pumping of fines.
    - c. Working drawings showing proposed types and plan locations of surface water control and the dewatering system to be used.
    - d. Working drawings shall include the arrangements, locations and depths of the dewatering system, a complete description of equipment and materials to be used and the procedure to be followed in installation, operation and maintenance in relation to the proposed sequence of excavation, foundation construction and backfilling.
    - e. The standby equipment and standby power supply.
    - f. The proposed locations of points of effluent treatment equipment, effluent flow equalization tanks and discharge of water.

- g. Location and size of sumps, ditches and water discharge lines, including their relation to water disposal points.
  - h. Submittals shall also include discharge details, metering, and reading schedules and the details of the settling tank and oil/water separator.
  - i. Methods to be used for drilling, construction, and development of wells and piezometers.
- 2. As-built Submittals: During installation of the dewatering system and prior to the start of construction dewatering, submit as-built conditions of the dewatering system. As-built data are to include but are not limited to:
  - a. Plans and sections showing as-built locations, and surveyed elevations of the dewatering system and its components.
  - b. Drawings to indicate changes made to the original working drawings to accommodate field conditions and to comply with design standards.
  - c. Details of installation including dimensions and materials used, description and drawings of all installations, all procedures, soil strata encountered and logs of soil samples.
- 3. Dewatering Sampling and Analysis Plan: The Dewatering Sampling and Analysis Plan shall include descriptions of sampling methods, storage of dewatering effluent and laboratory qualifications.
- 4. Submit a report comparing site groundwater quality data with effluent limits (Table 1).
- 5. Submit a Waste Water Quality Control Application and subsequent Letter of Approval (NYC DEP Division of Pollution Prevention and Control).
- 6. Submit a Sewer Use Application and subsequent Letter of Approval (NYC DEP Division of Connections and Permitting), if applicable.
- 7. Submit a Long Island Well Permit, if applicable.
- 8. The Contractor shall be responsible for compliance with all dewatering permit requirements once construction dewatering begins.

#### 1.06 QUALIFICATIONS

- A. The dewatering work shall be performed by a general contractor or a specialty subcontractor specializing in and having experience installing and operating dewatering systems in similar subsurface conditions for at least three (3) years.



- B. Dewatering system shall be designed by a Registered Professional Engineer having experience in successfully designing a system in similar site conditions.
- C. Well drillers shall be licensed in the State of New York.

#### 1.07 DEWATERING SYSTEM DESIGN REQUIREMENTS

- A. The Contractor shall design, provide, install, operate, maintain and remove the dewatering system as necessary to:
  - 1. Lower and maintain groundwater levels and hydrostatic pressures to 2 feet below the prevailing excavation level or to a point no higher than 2 feet above the top of an impermeable stratum, if the subgrade is in the impermeable stratum. Groundwater levels shall be lowered for a time period as deemed necessary by the Commissioner to ensure adequate factor of safety for the constructed structure.
  - 2. Maintain stable slopes and subgrade.
  - 3. Control and remove seepage and surface water into excavations.
  - 4. Allow subsequent work to be safely performed and not result in damage to adjacent properties, buildings, structures, utilities and other work.
  - 5. The Contractor shall provide primary and standby power, including all costs for installation, energy and fuel.
  - 6. The Resident Engineer will perform inspections and witnessing of:
    - a. Testing of sand and silt from dewatering wells.
    - b. Drawdown and performance testing of dewatering system.
    - c. Performance testing of standby power source and backup dewatering system.
- B. The method of dewatering and control of water both inside and outside the excavation shall be selected by the Contractor who shall be solely responsible for the location, arrangement and depth of any system(s) selected to accomplish the work. The Contractor shall construct protective works as necessary to dewater, cut off porous zones of fill and direct the flow of water from whatever source away from the excavations and adjacent areas. Protective works shall include slurry methods, grouting, clay seepage plugs, toe drains with appropriate filters, deep wells, wellpoints, sumps, dikes, ditches and all supporting features as required, but not specifically shown on the Contract Drawings, to permit construction in the dry.

## 1.08 DISPOSAL OF GROUNDWATER AND DEWATERING EFFLUENT

- A. The Contractor shall manage and dispose of groundwater generated during dewatering activities in accordance with the New York State Pollutant Discharge Elimination System (SPDES) standards set by the New York State DEC for discharge to surface water, and New York City DEP Sewer Discharge Criteria for discharge to the City wastewater collection system, as applicable. The Contractor shall acquire all necessary permits and/or applications for disposal of dewatering effluent.
- B. For discharge to the City wastewater collection system, a comparison of the site groundwater quality data with the Limitations for Effluent to Sanitary or Combined Sewers, June 2000, shall be required prior to the start of lowering of the water table.
- C. The following table lists these effluent limits:

<b>Table 1:</b> <b>New York City Department of</b> <b>Environmental Protection</b> <b>Bureau of Wastewater Treatment</b> <b>Limitations for Effluent to Sanitary or Combined Sewers</b> <b>June 2000</b>			
Parameter	Limitations	Units	Note
Temperature	<150	degrees F	
Total Petroleum Hydrocarbons	<50	mg/l	
PH	5-11	SU's	
Cadmium	2	mg/l	Daily average 0.69 mg/l
Chromium (total)	5	mg/l	
Copper	5	mg/l	
Lead	2	mg/l	
Mercury	0.05	mg/l	
Nickel	3	mg/l	
Zinc	5	mg/l	
Flash Point	>140	degrees F	
Benzene	134	ppb	
Ethylbenzene	380	ppb	
Toluene	74	ppb	
Xylenes (Total)	74	ppb	
PCBs (Total) *	1000	ppt	Method 608 by EPA only with MDL = 65 ppt
Total Suspended Solids	No Limit		
Perc	164		

<b>Table 1:</b> <b>New York City Department of</b> <b>Environmental Protection</b> <b>Bureau of Wastewater Treatment</b> <b>Limitations for Effluent to Sanitary or Combined Sewers</b> <b>June 2000</b>			
<b>Parameter</b>	<b>Limitations</b>	<b>Units</b>	<b>Note</b>
MTBE			
Napthalene	47		
Other			As appropriate
*Analysis for PCBs are requested only if both conditions listed below are met:			
1) if proposed discharge >10,000 gpd;			
2) if duration of a discharge >10 days.			

- D. The Contractor shall provide appropriately sized settling tanks to collect and store dewatering effluent commensurate with dewatering discharge rates to allow for settlement of suspended solids and sampling as required by disposal/discharge criteria. The tanks shall be equipped with an overflow collection system to prevent accidental release of dewatering effluent. Routine inspection of the tanks shall be carried out daily to ensure that tank integrity is being maintained, and that all valves or tank openings are properly locked out to avoid accidental discharge. Settling tanks shall be cleaned frequently to prevent excess deposition of solids that could overflow from the tank. Removed solids shall be classified and disposed of in accordance with applicable Section 02225 - Impacted Soil Handling and Section 02316 - Excavation requirements for manifests and material transport and disposal.
1. The settling tank shall be concrete or steel as manufactured by Rockford, HyrdoFlow Technologies Inc., Ecologix Environmental Systems or approved equal, and sized based upon the maximum groundwater flow times a 1.5 safety factor.
- E. The Contractor shall provide appropriately sized oil/water separators to prevent discharge of hydrocarbons, grease and other floatable materials to surface water or the sewer system. Oil/water separators shall be cleaned frequently and collected materials classified and disposed of in accordance with applicable Section 02225 - Impacted Soil Handling and Section 02316 - Excavation requirements for manifests and material transport and disposal.
1. The oil/water separator shall be concrete or steel as manufactured by Rockford, Pan America Environmental, Inc., Hydro Flow Technologies, Inc or approved equal, and sized based upon the maximum groundwater flow times a 1.5 safety factor.
- F. The Contractor shall provide treatment for, or remove from the site to an approved disposal facility, all dewatering effluent or groundwater which exceeds any limit set for surface water or sewer discharge, whichever is applicable. Classification and disposal shall conform to applicable Section 02225 - Impacted Soil Handling and

Section 02316 - Excavation requirements for manifests and material transport and disposal. No separate payment will be made for treatment or disposal of such effluent or groundwater.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Materials and equipment used in the dewatering system shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of construction dewatering.
- B. Back up equipment for the dewatering system shall be identical to the primary equipment and shall be available in operating condition at all times.

## PART 3 EXECUTION

### 3.01 GENERAL REQUIREMENTS

- A. Construction dewatering is required to protect foundation subgrades and to maintain dry conditions for construction. The Contractor shall maintain a continuous and completely effective dewatering system for the required time as specified in Section 02316 - Excavation.
- B. The Contractor shall contact the NYSDEC a minimum of two (2) weeks in advance of dewatering system startup.
- C. The Contractor shall coordinate the operation of its dewatering system with existing and proposed construction.
- D. The Contractor shall be prepared to modify the dewatering system and methods as required by actual field conditions encountered during construction, at no additional cost to the City of New York.
- E. The Contractor shall measure water levels periodically in observation wells installed adjacent to nearby structures to ensure drawdown outside the excavation is within permissible limits specified.
- F. Surface areas adjacent to the excavation shall be graded and/or curbed to prevent flow of surface water into the excavation.

### 3.02 TESTING

- A. The Contractor is responsible for monitoring his dewatering efforts to determine if the project requirements are being met. The Contractor shall provide observation wells and other means to monitor the dewatering as detailed in the Dewatering Plan.

- B. Readings to determine the quantity of fines in the pumped water shall be made in accordance with permit requirements or once every two weeks, whichever is more stringent.

### 3.03 INSTALLATION AND OPERATION

- A. The dewatering system shall provide for an uninterrupted flow of pumped water and shall be maintained and pumped as necessary to drawdown and maintain the groundwater levels as specified. Unless otherwise specified, pumping shall maintain those depressed levels until the permanent under drainage system has been installed, tested, accepted and is operational or until the permanent structure is capable of withstanding hydrostatic pressures as determined by the Commissioner.
- B. The Contractor shall furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and its underlying soil. Dewatering operations shall operate in such a manner so that the excavation can proceed while maintaining stable slopes and the designed lateral support for the perimeter support of excavation walls, without disturbing the bearing subgrades for the structure. The ground water level as measured in observation wells shall be lowered and maintained at least two feet below the prevailing excavation level, or it shall be lowered to a point no higher than 2 feet above the top of impermeable stratum if the subgrade is in the impermeable stratum.
- C. The dewatering system shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and shall not influence the stability of surrounding areas. Well points and deep wells shall be properly sanded in and sumps shall be sheeted and provided with proper filter material.
- D. A sufficient number of observation wells shall be installed and water levels read by the Contractor, at least weekly, to demonstrate that the goals of the dewatering system are being met. Water level readings shall be submitted within 24 hours to the Commissioner. If applicable, the Contractor may make use of existing observation wells as shown on the Contract Drawings.
- E. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the ground or instability of slopes will not be permitted.

### 3.04 SURFACE WATER

- A. Surface water on and around the site shall be collected into local sumps by means of trenches, pipes, or other means. The Contractor shall discharge the water into the City of New York wastewater collection system. Direct surface water to minimize surface erosion, ponding and softening of slopes and berms, including haul roads and equipment working stations. Slope protection by means of polyethylene sheets, held in place by tires or otherwise, shall be provided locally as required. At the perimeter of the excavation, surface water is to be directed into the sewer system

and not permitted to enter the excavation. Curbs shall be maintained and, where necessary, extended across intersections, curb cuts and defective curb sections. Surface cracks in the adjacent streets are to be sealed and re-sealed as necessary. Should adjacent settlement occur during the work, curbs shall be raised or watertight mounds shall be installed as directed by the Commissioner to prevent flow into the site.

### 3.05 DISPOSAL OF DEWATERING EFFLUENT

- A. Dewatering effluent discharge to the City of New York wastewater collection system may be affected by rainfall. The Contractor shall provide adequate equalization and holding tanks to allow work to proceed in the case of restricted discharge capability during rain events.
- B. The Contractor shall provide sufficient clean water to flush all sewers and drains when necessary. If any sewer, drain, catch basin, or inlet becomes filled or partially filled with sediment or debris, the Contractor shall promptly and satisfactorily remove such deposits.
- C. The Contractor shall collect one dewatering effluent sample per discharge point, to be submitted as part of the Wastewater Quality Control Application, in order to complete analyses for parameters listed in Table 1. If pretreatment, other than oil/water separators and settling tanks, is required, the Contractor shall continue to collect effluent samples during dewatering operations, and analyze for all listed parameters at intervals based on dewatering discharge volume as a verification of discharge compliance. Intervals will be as required. A copy of all analytical results shall be submitted for review and approval, no later than one day after receipt of such data. The Contractor shall provide for prompt sampling and turn-around times so as not to delay the project, but in no case shall turn-around time be longer than 5 calendar days.
- D. The Contractor shall obtain and pay for all permits, applications and licenses required by law that are associated with the disposal of dewatering effluent, including NYSDEC SPDES Permit, if applicable.
- E. The Contractor shall submit a Wastewater Quality Control (WQC) Application for combined sewer use to the NYC DEP Division of Pollution Prevention and Control - Compliance Engineering Section. The initial effluent sampling results shall be submitted as part of the application. These samples may be collected either from representative nearby groundwater monitoring wells, which shall be purged (3 well volumes) prior to sampling, or from each known dewatering well following well development.
- F. If discharge to the combined sewer system is greater than 10,000 gallons per day (GPD) and/or a new sewer connection is needed, the Contractor shall submit a Sewer Use Letter of Approval to the NYC DEP Division of Connections and Permitting. The Sewer Use Letter of Approval, signed by a Professional Engineer in

the State of New York, must include the Dewatering Plan and the WQC Application Letter of Approval. If pretreatment, other than oil/water separators and settling tanks, is necessary, treatment train effluent must be held in settlement tanks until analytical sample results verifying compliance with all criteria, as listed in Table 1, are sent to the NYC DEP Division of Pollution Prevention and Control for final approval. Once approval is received, the Contractor shall discharge effluent via gravity flow to the sewer system at allowable discharge rates.

- G. The Contractor shall allow 60 days for NYC DEP WQC permitting and Sewer Use Letter of Approval processing.
- H. The Contractor shall select and supply Personal Protective Equipment (PPE) in accordance with the Contractor's site-specific Health and Safety Plan required in Section 01356 - Safe and Healthful Working Conditions.
- I. All portions of the dewatering system shall be removed by the Contractor immediately after completion of dewatering activities.

-END OF SECTION-

**Section 02291**  
**AIR MONITORING PROGRAM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for the Contractor to implement a work area air monitoring program during building demolition, soil removal/handling/backfilling activities, and other activities that could potentially generate impacted airborne particulates or volatile organic vapors under this Contract.
- B. Requirements for the Resident Engineer to implement a perimeter air monitoring program (airborne particulates and volatile organic vapors) during building demolition, soil removal/handling activities, and other activities that could potentially generate impacted airborne particulates (e.g., lead, arsenic, etc.) or volatile organic vapors under this Contract.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 - Regulated Materials Control
- B. Section 01356 - Safe and Healthful Working Conditions
- C. Section 02222 - Demolition and Removal
- D. Section 02223 - Demolition of Building Components Coated with Lead- and Cadmium-Containing Paint - Environmental Requirements
- E. Section 02224 - Removal of Arsenic-Impacted Wood - Environmental Requirements
- F. Section 02225 - Impacted Soil Handling
- G. Section 02316 - Excavation
- H. Section 02317 - Backfilling
- I. Section 13210 - Closure of Aboveground Petroleum Storage Tank
- J. Section 13284 - Removal of Asbestos-Containing Materials
- K. Section 13285 - Removal of Loose Paint
- L. Section 13286 - Removal of Bird Excrement

**1.03 WORK SPECIFIED FOR CONTRACTOR**

- A. The Contractor shall provide all labor, equipment, materials, and services necessary to perform air monitoring in accordance with the Contractor's site-specific Health and Safety Plan (HASP) (required in Section 01356 - Safe and Healthful Working Conditions), applicable Occupational Health and Safety Administration (OSHA) regulations, and in accordance with the requirements of this Section. The HASP shall address air monitoring and air sampling to determine the proper level of personal protective equipment (PPE) and determine the extent of safety requirements for confined space entry (if needed).



- B. The Contractor shall provide all labor, equipment, materials, and services necessary to install and maintain a temporary meteorological station in accordance with the manufacturer's specifications and the protocols specified in this Section. The temporary meteorological station shall continuously monitor ambient air temperature, wind direction, and wind speed.
- C. The Contractor shall implement the appropriate corrective action as required in Article 3.03 of this Section and in the Contractor's site-specific HASP if any of the action levels in the work area are exceeded.
- D. The Contractor may conduct perimeter air monitoring (outside the immediate work area) to evaluate the effectiveness of engineering controls and/or dust vapor suppression methods at no additional cost to the City. However, decisions regarding corrective actions to be implemented by the Contractor will be made by the Resident Engineer.

#### 1.04 WORK PERFORMED BY ENGINEER

- A. The Resident Engineer will establish the background concentrations for airborne particulates and volatile organic vapors in the vicinity of the site as described in Article 3.02 of this Section prior to construction activities.
- B. The Resident Engineer will perform real-time perimeter air monitoring (outside the immediate work area) to evaluate and document the effectiveness of engineering controls and/or dust/vapor suppression methods implemented by the Contractor. The perimeter air monitoring program will include monitoring for potentially impacted airborne particulates and volatile organic vapors as described in this Section. The determination as to what activities could generate potentially impacted particulates will be made by the Resident Engineer. Air monitoring activities conducted by the Resident Engineer do not alleviate any of the Contractor's air monitoring responsibilities.
- C. The Resident Engineer will compare real-time perimeter readings during the demolition and construction activities to the action levels presented in Article 3.03 of this Section and will notify the Contractor if the levels are exceeded.

#### 1.05 SUBMITTALS

- A. Within 30 calendar days prior to the commencement of mobilization activities, the successful Contractor shall submit the following items for review in accordance with the requirements specified in Section 01355 – Regulated Materials Control:
  - 1. A Dust Control Plan including a description of controls and actions that the Contractor proposes to utilize to respond to potential migration of elevated levels of airborne particulates or volatile organic vapors beyond work area limits.

2. A detailed manufacturer's specification for the proposed meteorological station and a map indicating the proposed general location of the meteorological station.

## PART 2 PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT PROVIDED BY THE CONTRACTOR

- A. The Contractor shall provide a meteorological station that will continuously monitor ambient air temperature, wind direction, and wind speed. The meteorological station shall be a Met One meteorological system (or approved equal).
- B. The Contractor shall provide materials and equipment necessary to perform air monitoring within the work area in accordance with the Contractor's HASP and applicable OSHA regulations.
- C. The Contractor shall provide labor, equipment, and materials for implementing corrective action activities (i.e., dust and volatile organic vapor suppression, modifying work procedures, etc.). The Contractor shall implement corrective actions if the action levels presented in Article 3.03 of this Section are exceeded or if deemed necessary by the Resident Engineer.

### 2.02 MATERIALS AND EQUIPMENT PROVIDED BY THE ENGINEER

- A. The Resident Engineer will provide its own air monitoring equipment to conduct real-time perimeter air monitoring.

## PART 3 EXECUTION

### 3.01 CONTRACTOR

- A. The Contractor shall provide all labor, equipment, materials and services necessary to install and maintain the meteorological station in accordance with the manufacturer's specifications and the protocols specified in this Section. The meteorological station shall be installed at a location proposed by the Contractor and reviewed by the Resident Engineer that allows the Resident Engineer continuous and unrestricted access to the meteorological station. The Contractor shall protect the meteorological station against theft and vandalism.
- B. If relocation of the meteorological station is required to accommodate the work, the Contractor shall provide all equipment, materials, and labor to relocate the meteorological system at no additional cost to the City. The new location shall comply with requirements discussed in Paragraph 3.01A of this Section.
- C. Air monitoring shall be performed by the Contractor within active work area limits in accordance with the Contractor's HASP and applicable OSHA regulations. Air

monitoring shall be performed by the Contractor within active work areas during building demolition, soil removal/handling activities, and other activities that could potentially generate airborne impacted particulates or volatile organic vapors.

- D. The air monitoring data shall be recorded on an air monitoring log and shall be maintained in an onsite project file. Real-time air quality monitoring data shall be provided to the Resident Engineer for review/evaluation on a daily or as-requested basis.
- E. The Contractor shall implement corrective actions if airborne particulates and/or volatile organic vapors detected at the perimeter exceed action levels outlined in Article 3.03 of this Section.
- F. At least two days prior to the commencement of building demolition, soil removal/handling/backfilling, and other activities that could potentially generate airborne impacted particulates or volatile organic vapors, the Contractor shall inform the Resident Engineer of the work activities scheduled. If the schedule changes, the Contractor shall notify the Resident Engineer.

### 3.02 ENGINEER

- A. Real-time airborne particulate monitoring and real-time volatile organic vapor monitoring (if applicable) will be performed by the Resident Engineer at the perimeter to evaluate and document the effectiveness of the engineering controls and/or dust/vapor suppression methods implemented by the Contractor. The perimeter air monitoring activities will be conducted a minimum of four times per day during building demolition, soil removal/handling activities and other activities that could potentially generate impacted airborne particulates or volatile organic vapors. If an exceedence is measured, or if potentially impacted visible dust is observed leaving the work area, perimeter air monitoring activities will be conducted at a minimum frequency of twice an hour (or as determined by the Resident Engineer). The perimeter monitoring data will be compared to the action levels presented in Article 3.03 of this Section indicating the need for the Contractor to implement additional control measures and/or to stop work.
- B. Perimeter air monitoring will be conducted at four perimeter monitoring locations (two upwind locations and two downwind locations, such that a rectangle is formed around the perimeter of the work area). The perimeter monitoring locations will be adjusted if the wind direction changes more than 45 degrees. The perimeter monitoring locations will be determined by the Resident Engineer and will be based on wind speed, wind direction, and type of work activities being conducted.
- C. The Resident Engineer will establish the airborne dust and volatile organic vapors background concentrations at the site as described below.
  - 1. Within three weeks prior to Contractor's mobilization to the site, a background particulate and volatile organic vapor study will be performed by

the Resident Engineer to measure background concentrations of airborne particulates and volatile organic vapors at the site.

2. Airborne particulate levels will be measured during normal work hours (e.g., 7:00 a.m. to 5:00 p.m.) every 30 minutes on three separate days. The arithmetic average of the background particulate concentrations from the background study will be used to establish the background concentrations for airborne particulates and volatile organic vapors for use in the monitoring activities specified in this Section.
3. Concentrations of volatile organic vapors will be measured using a photoionization detector during normal work hours (e.g., 7:00 a.m. to 5:00 p.m.) every 30 minutes on three separate days. The arithmetic average of the volatile organic vapor concentrations from the background study will be used to establish the background ambient air concentration for use in the monitoring activities specified in this Section.

### 3.03 PERIMETER AIR MONITORING ACTION LEVELS

- A. The airborne constituent action levels for the real-time perimeter air monitoring conducted during building demolition, soil removal/handling/backfilling activities and other activities that could potentially generate impacted airborne particulates are presented in the following table.

Parameter	Site Perimeter Action Level	Action
Airborne Particulates	0 to 100 $\mu\text{g}/\text{m}^3$ (above predetermined background) and no visible dust leaving work area	Contractor shall continue normal operations.
	100 to 150 $\mu\text{g}/\text{m}^3$ (above predetermined background) and/or visible dust leaving work area	Contractor shall implement dust suppression/engineering control measures as outlined in the Dust Control Plan (prepared by the Contractor and reviewed by the Resident Engineer).
	> 150 $\mu\text{g}/\text{m}^3$ (above predetermined background)	Contractor shall stop all work activities, identify the source of the particulates, and implement measures outlined in the Dust Control Plan (prepared by the Contractor and reviewed by the Resident Engineer) at no additional cost to the City of New York. After these steps are performed to the satisfaction of the Resident Engineer, work activities can resume provided that the particulate level (measured by the Resident Engineer) 200 feet downwind of the work area or half the distance to the nearest potential receptor, whichever is less or as determined by the Engineer, is below 100 $\mu\text{g}/\text{m}^3$ (above background).
Volatile Organic Vapors	0 to 5 ppm (above predetermined background)	Contractor shall continue normal operations.

Parameter	Site Perimeter Action Level	Action
	> 5 ppm (above predetermined background)	Contractor shall stop work activities, identify the source of vapors, and implement corrective actions to abate emissions at no additional cost to the City of New York. After these steps are performed to the satisfaction of the Resident Engineer, work activities can resume provided that the total organic vapor level (measured by the Resident Engineer) 200 feet downwind of the work area or half the distance to the nearest potential receptor, whichever is less or as determined by the Resident Engineer, is below 5 ppm (above background).

### 3.04 HEALTH AND SAFETY PROTOCOLS

- A. The Contractor shall comply with all applicable federal, state, and local regulations (including, but not limited to, OSHA regulations codified at 29 CFR 1926) during the implementation of the work. The work described in this Section shall be conducted in accordance with the Contractor's site-specific HASP, which is described in Section 01356 – Safe and Healthful Working Conditions.

-END OF SECTION-

**Section 02316  
EXCAVATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This specification describes excavation and disposal of all material as specified herein, shown on the Contract Drawings or required, for the purpose of building structures, conduits, pipelines and other structures as well as grading and completing the work in every respect.
- B. Excavation work includes sheeting and bracing, excavation over the site, excavation for roads, pipelines and structures, control of water, segregation and stockpiling of excavated material, disposal of unsuitable and excess excavated material, and trimming, shaping and grading of excavations, all complete and in place as shown on the Contract Drawings, specified, required and directed. The work includes the excavation of any material that, in the opinion of the Engineer, is necessary to be excavated for any purpose pertinent to the construction of the work. The requirements for clearing and grubbing are set forth in Section 02230 - Site Clearing.
- C. All excavated soil shall be considered impacted soil unless otherwise specified or directed by the Engineer. Impacted soil is to be handled in accordance with the requirements of Section 02225 - Impacted Soil Handling

**1.02 RELATED SPECIFICATIONS**

- A. Section 01120 - Contract Summary
- B. Section 01330 - Shop Drawings
- C. Section 01355 - Regulated Materials Control
- D. Section 02222 - Demolition and Removals
- E. Section 02225 - Impacted Soil Handling
- F. Section 02230 - Site Clearing
- G. Section 02240 - Dewatering
- H. Section 02317 - Backfilling
- I. Section 02371 - Dust, Soil Erosion and Sedimentation Control
- J. Section 02821 - Metal Fence
- K. Section 13287 - Environmental Waste Transportation and Disposal

**1.03 PAYMENT**

- A. The cost of all excavation shown on the Contract Drawings and necessary to complete the work shown shall be included in the lump sum prices bid for Bid Items 1, 2 and 3.

- B. The cost of additional earth excavation shall be paid as described in Section 01270 – Measurement and Payment.
- C. If any soils are encountered meeting the definition of unforeseen soil conditions per Section 02225 – Impacted Soil Handling, the additional costs associated with handling, transportation and disposal of such unforeseen regulated material shall be addressed as described in Section 01355 – Regulated Materials Control.

#### 1.04 REFERENCES

- A. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>)
- B. Occupational Safety and Health Administration, U.S. Department of Labor
- C. Board of Standards and Appeals, N.Y.S. Department of Labor
- D. New York City Rules and Regulations
- E. New York State Department of Transportation, Standard Specification, 2002
- F. New York State Department of Environmental Conservation
- G. U.S. Department of Transportation, Federal Highway Administration
- H. U.S. Environmental Protection Agency
- I. National Bureau of Standards Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations."
- J. Guide Design Specifications for Bridge Temporary Works, AASHTO, Latest Edition.

#### 1.05 DEFINITIONS

- A. The term "excavation" shall mean the excavation of all material regardless of its nature.
- B. Topsoil: Topsoil is friable clay loam surface soil found in a depth of not less than 4 inches, and is substantially free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

## 1.06 DESIGN REQUIREMENTS

- A. In designing the sheeting, take note of the minimum load diagram requirements shown in Attachments A and B at the end of this Section, unless otherwise shown on the Contract Drawings. However, when it is anticipated that heavier crane or equipment loads will fall within the influence line of the excavation, increase design loads accordingly.

## 1.07 SUBMITTALS

- A. Provide all submittals in accordance with Section 01330 - Shop Drawings.
- B. A Dewatering Excavation Plan shall be submitted in accordance with requirements of Section 02240 - Dewatering.
- C. Sheeting and Bracing: Submit a certificate (only), signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State of New York that certifies that the Licensed Professional Engineer has evaluated and approved the Contractor's excavation plan and has prepared complete design calculations and working drawings for the shoring, sheeting and bracing, not specifically shown on the Contract Drawings, which will be used for excavation support. Provide a separate certificate for each excavation before starting the excavation. Where commercially manufactured trench boxes are to be used, provide a certificate from the Contractor's Licensed Professional Engineer stating the conditions under which the trench boxes will be used.
- D. Soil Excavation, Transport and Disposal Plan: Submit a Soil Excavation, Transport and Disposal Plan to the Commissioner for approval at least 30 calendar days prior to the start of excavation. This plan shall include excavation methods and transportation and disposal protocols to be used for impacted soil (as defined in Section 02225 - Impacted Soil Handling) in accordance with all applicable Federal, State and local hauling and disposal codes and regulations.
  - 1. Excavation Plans shall include, but not be limited to, the following:
    - a. Limits of excavation
    - b. Protection methods:
      - (1) Sheeting and bracing
      - (2) Fencing, bridging and decking
  - 2. Excavated soil shall be handled, transported and disposed of in accordance with Section 02225- Impacted Soil Handling, Section 13287 - Environmental Waste Transportation and Disposal and all current applicable federal, state, and local regulations.



**1.08 REGULATORY REQUIREMENTS**

- A. General: Before proceeding with any excavation, obtain all necessary permits required by City Departments having jurisdiction, or consents from owners of private property where their interests may be affected by the work, such as for temporary or permanent occupation, for disposal or storage of materials, or other encroachment except where temporary easements may have been obtained by the City in connection with permanent easements or otherwise.
- B. During the course of the excavation operations and related work, strictly follow the applicable sections of "Excavation" as outlined in Rule No. 23 of the Industrial Code (Board of Standards and Appeals, N.Y.S. Department of Labor) latest edition.
- C. In the period of 2 to 10 days prior to starting excavation, notify all utilities of intended work locations and have utility locations marked.

**1.09 SITE CONDITIONS**

- A. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions. Geotechnical data reports are available as described in Section 01120 - Contract Summary.
- B. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of work.
- C. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and the methods to be used to excavate these materials.

**1.10 DUST, SOIL EROSION AND SEDIMENTATION CONTROL**

- A. The Contractor's operations shall conform to the requirements of Section 02371 - Dust, Soil Erosion and Sedimentation Control.

**PART 2 PRODUCTS****2.01 MANUFACTURERS AND MATERIALS**

- A. Use manufacturers and materials for shoring, sheeting and bracing as recommended by the Contractor's Licensed Professional Engineer who designed the shoring, sheeting, and bracing. Where wood lagging is to be left in place, use oak or treated fir or treated pine. Use only environmentally safe treatment for wood lagging.

## PART 3 EXECUTION

## 3.01 GENERAL

- A. No excavation work shall begin before the Dewatering Excavation Plan is approved, as specified in Section 02240 - Dewatering.
- B. Clearing and Grubbing: Clear and grub the site of all open cut excavations and all areas shown on the Contract Drawings and specified. The Contractor shall comply with the requirements of Section 02230 - Site Clearing.
- C. Sheeting and Bracing: Provide safe working conditions, prevent shifting of material, prevent damage to structures or other work, and avoid delay to the work, all in accordance with applicable laws and regulations. Properly shore, sheet, and brace all excavations that are not cut back to the proper slope, as determined by the Contractor's Licensed Professional Engineer.
  - 1. Take sole responsibility for the design and adequacy of shoring, sheeting and bracing not shown on the Contract Drawings.
  - 2. Take sole responsibility for the methods of installation of the shoring, sheeting and bracing.
- D. Structure Excavation
  - 1. Excavations shall be of sufficient size to permit the work to be economically and properly constructed in the manner and of the size specified, except where limits of excavation are provided on the Contract Drawings. The bottom of the excavation in earth and rock shall have the shape and dimensions of the underside of the structure with allowance for the concrete workmat or compacted aggregate base layer.
  - 2. Exercise care to prevent disturbing or loosening of the soil in the excavation. Densify the bearing surface for all structures with an approved type vibratory compactor to 95 percent of the maximum dry density obtainable by ASTM D1557 before the construction of any foundations. Where the depth of disturbed or loosened soils is greater than 12 inches or as determined by the Commissioner that it will require special compaction, the Contractor shall propose the appropriate method of compaction and submit to the Commissioner for approval. All disturbed or loosened soils as determined by the Commissioner that should be removed shall be replaced in accordance with the requirements of Paragraph 3.01I "Unauthorized Excavation".
  - 3. Whenever abandoned existing piles are encountered during excavation, they shall be cut off at least 18 inches below the bottom of new footings, unless otherwise indicated on the Contract Drawings, and shall not be pulled.

- E. Site Excavation: Excavate over the site within the limits of site grading to conform to finished site grades. Arrange the excavation work to permit continuous surface drainage, eliminate low spots and surface ponding, and prevent runoff from flowing into the surrounding areas.
- F. Protection of Plants and Structures: Before starting excavation, clear away all obstructions that are to be removed or relocated. Comply with the requirements of Section 02230 - Site Clearing.
- G. Trench Excavation
  - 1. Maintain the minimum trench width adequate to place, joint and backfill the pipe or conduit properly. The clear width of the trench at the level of the top of the pipe shall not exceed the sum of the outside diameter of the pipe barrel plus 20 inches for pipe 4 through 24 inches in diameter nor the outside diameter of the pipe barrel plus 2 feet for pipe more than 24 inches in diameter, unless otherwise approved by the Commissioner. The banks of pipe trenches shall be as near to vertical as practicable.
  - 2. Length of Excavation: Make excavation for the sewers, drains, ducts, conduits or pipe lines only a reasonable distance in advance of pipe laying, at the discretion of the Resident Engineer, and as may be indicated by the supply of materials on hand.
  - 3. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.
    - a. Pipes placed in trenches wider than specified above shall be provided with concrete cradle or encasement as directed by the Resident Engineer. No separate payment will be made for such cradles or encasement.
    - b. The bottom of trenches shall be graded accurately to provide uniform base for pipe bedding.
    - c. Remove stones as necessary to avoid point bearing. Except as hereinafter specified for wet or otherwise unstable material, backfill overdepths with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, over excavate such material (a minimum of 2 feet below pipe) to a depth to allow for construction of stable pipe bedding. Backfill the trench to the proper grade with suitable approved materials.
    - d. If unstable material is exposed at the level of the bottom of the trench excavation, it shall be excavated in accordance with Paragraph 3.01H "Authorized Additional Excavation". When the Resident Engineer

judges that the unstable material extends to an excessive depth, he may advise the Contractor, in writing, to stabilize the trench bottom with additional select fill or pipe bedding material or to ensure firm support for the pipe or electrical duct by other suitable methods.

- e. The open, excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place shall be kept to a minimum length, causing the least possible disturbance. Ladders shall provide means of exit from the trench without more than 25 feet of lateral travel. Ladders shall extend a minimum of 36 inches above the top of the sheeting or be tied down.
  - f. No water shall be allowed to rise in the trench excavation until sufficient backfill has been placed to prevent pipe flotation.
- H. Authorized Additional Excavation: In case the materials encountered at the elevations shown on the Contract Drawings are not suitable, or in case it is found desirable or necessary to go to an additional depth or to an additional depth and width, carry the excavation to such additional depth and width as the Resident Engineer may direct in writing. Refill such excavated space with either 2,500 psi concrete or compacted select fill materials, as ordered. Where necessary, compact fill materials to avoid future settlement. Use select fill materials meeting the requirements of Section 02317 and compact to attain a minimum degree of compaction of 95 percent of the maximum dry density as determined by ASTM D1557. Place backfill in lifts not exceeding 9 inches in loose thickness.
- I. Unauthorized Excavation: Wherever the excavation is carried beyond or below the lines and grades shown on the Contract Drawings or given by the Resident Engineer, except as specified in Paragraph 3.01H "Authorized Additional Excavation", refill all such excavated space with such material and in such a manner as may be directed by the Commissioner in order to ensure the stability of the various structures. Areas excavated beneath all manholes, structures, pipelines or conduits without authority shall be refilled by the Contractor at its own expense with 2,500 psi concrete or compacted select fill material and properly compacted as ordered by the Resident Engineer.
- J. Explosives: Do not use explosives for any clearing, grubbing or excavation work.
- K. Contaminated and/or hazardous materials shall be handled in accordance with Section 01355 - Regulated Materials Control and all applicable Federal, State and Local Regulations.

### 3.02 LINES AND GRADES

- A. General: Excavate for sewers, drains, conduits, pipe lines, walls, foundations, footings, and other structures, including any excavating indicated on the Contract

Drawings or necessary, to the lines and grades shown on the Contract Drawings, specified or required.

- B. Demolition: Cut pavements, curbs and sidewalks in compliance with Section 02222 – Demolition and Removals.
- C. Adequate Space: Perform all trimming, grading and other incidental work to the grades and slopes shown on the Contract Drawings, specified or required as approved by the Commissioner. Perform all excavations of sufficient size for the proper execution and inspection of the work. Keep excavation in good condition at all times and fill all voids that may endanger existing structures to the satisfaction of the Resident Engineer.

### 3.03 SUBGRADE CONSOLIDATION

- A. Consolidating Suitable Materials: Materials used in the bottom of excavation to replace boggy and other yielding or unsound materials for providing solid and firm foundations for the structures to be built thereon, where approved in writing, may be either select fill or lean concrete.

### 3.04 FROST PREVENTION

- A. Protection shall be provided against the penetration of frost into material below the bearing level during work in the winter months. This protection shall consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other approved means.

### 3.05 SEGREGATION, STORAGE AND DISPOSAL OF MATERIALS

- A. Excavated soil shall be handled, transported and disposed of in accordance with Section 02225 - Impacted Soil Handling, Section 13287 – Environmental Waste Transportation and Disposal and all current applicable federal, state, and local regulations.

### 3.06 SHEETING AND BRACING

- A. Arrange shoring, sheeting and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- B. If the Contractor or its Licensed Professional Engineer is of the opinion that at any time the Contractor's excavation plan, shoring, sheeting or bracing is inadequate or unsuited for the purpose, take immediate and appropriate action. Provide a new certificate if the Contractor's excavation plans, shoring, sheeting or bracing require modifications.

- C. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting, shoring and bracing.
- D. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.
- E. Removal of Sheeting
  - 1. When the sheeting and bracing for the vertical sides of such trench excavations is not required to be left in place, such sheeting and bracing shall be removed, and backfill shall be placed and compacted to an elevation at least 1'-6" above the top of the pipe or conduit. Any exception to this requirement will be shown on the Contract Drawings.
  - 2. Where sheeting and bracing is removed, it shall be done as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures, except as otherwise shown on the Contract Drawings or directed. Carefully fill voids left by the withdrawal of the sheeting by ramming or otherwise as directed by the Resident Engineer.
  - 3. Obtain permission of the Resident Engineer before the removal of any shoring, sheeting or bracing. Such permission by the Resident Engineer shall not relieve the Contractor of responsibility for injury to structures or to other property or persons resulting from failure to leave such sheeting and bracing in place.
  - 4. Load from rakers, struts and corner braces shall be released in a controlled fashion by cutting kickers and removing wedges and shims, as approved by the Resident Engineer.
- F. Permission for Removal: Obtain permission from the Contractor's Licensed Professional Engineer before the removal of any shoring, sheeting or bracing. Retain the responsibility for injury to structures or to other property or persons for failure to leave such shoring, sheeting and bracing in place even though permission for removal has been obtained.
- G. Credit: Sheeting and bracing required to be provided by the Contract Drawings or the Specifications and subsequently allowed or ordered in writing by the Engineer to be omitted shall be subject to suitable credit to the City. Measurement of sheeting and bracing limits subject to suitable credit shall extend from the subgrade to within 18 inches of the ground surface in the case of vertical sides, regardless of stages; and shall extend from the subgrade to 12 inches above the junction of the vertical and sloping sides in the case of excavations with sloped sides above and vertical sides below. Sheeting and bracing indicated to be omitted on the Contract Drawings or in the Specifications will not be subject to credit.

### 3.07 SHEETING AND BRACING LEFT IN PLACE

- A. All sheeting and bracing in excavation for sewer pipe lines, including manholes and chambers, shall be left in place except where otherwise shown on the Contract Drawings, specified or ordered in writing by the Engineer. Sheeting left in place shall be cut off at the elevation shown on the Contract Drawings, or at least 18 inches below final grade. Bracing remaining in place shall be driven up tight.
- B. Where it is necessary to remove cross braces to make way for sewer pipe, manholes, and chambers, rebrace the sheeting in a manner approved by the Engineer, but in no case shall sheeting be braced against the sides of pipe or structures, unless approved in writing by the Engineer.
- C. Leave sheeting and bracing in place in excavations for structures other than pipe lines where shown on the Contract Drawings, specified or ordered in writing by the Engineer to be left in place. Where such sheeting is to be left in place, the original braces shall not be removed and the sheeting shall not be rebraced against the structure unless it is approved by the Engineer.
- D. Sheeting and bracing to be left in place shall include all elements of the sheeting and bracing regardless of the type used, except such braces required to be removed to make way for the structure or pipe line being constructed. Where lagging and "soldier" beams are used, the "soldier" beams shall also be left in place.
- E. In excavations with vertical sides for the full depth, cut off sheeting left in place at the elevations provided in writing by the Engineer, but in general, such cutoffs shall not be less than 18 inches below the existing ground surface. In excavations with sloped sides above and vertical sides below, cut off sheeting at the top of the vertical sides of the excavation. Cut off timber sheeting by sawing, and steel sheeting or "soldier" beams by burning. Breaking off sheeting will not be permitted.
- F. Do not remove sheeting and bracing not shown on the Contract Drawings or specified to be left in place without first obtaining a statement in writing from the Engineer that such sheeting may be removed.
- G. No separate payment will be made for sheeting and bracing left in place, the cost thereof shall be included in the lump sum bid for Bid Item 1 under this Contract.

### 3.08 REMOVAL OF WATER

- A. Conform to the requirements of Sections 02240 - Dewatering and 02371 - Dust, Soil Erosion and Sedimentation Control and Section 02225 - Impacted Soil Handling.
- B. Care of Water: At all times during construction of the work and at its completion for final inspection, provide and maintain ample means and suitable equipment with

which to promptly remove and properly dispose of all water and sewage entering excavations or other parts of the work. Keep all excavations dry at all times until the structures to be built therein are completed and backfilled to approximately final grades except where otherwise approved by the Resident Engineer in writing. Do not permit sewage from existing sewers and house connections to flow into excavations.

- C. To prevent flotation or uplift of the structure or portions of the structure under construction, provide approved dewatering or freezing methods which shall operate under supervision 24 hours per day, including holidays and weekends. Maintain this dewatering or other system in continuous operation until the structure or portions of the structure are substantially completed to a gravity load 10 percent greater than the upward load caused by the ground water uplift pressure measured and computed from the original ground water level. Place backfill and mechanically compact it to approximately final grade after the structure has achieved the required strength, except where otherwise approved by the Engineer in writing. In addition, provide and have available at the work site suitable standby equipment for prompt replacement during breakdowns of operating equipment.
- D. The dewatering system shall be maintained in operation until the backfill is completed to a minimum of one foot above normal ground water level.
- E. Obtain written approval from the Resident Engineer before discontinuing the dewatering or other groundwater control system.
- F. Where water or sewage has accumulated or is flowing in the completed or partly completed structures, remove and dispose of such water or sewage during the time covered by the Contract, unless otherwise directed by the Resident Engineer.
- G. The Contractor shall take care of all sewer drainage interfered with by its operations to the satisfaction of the Resident Engineer. Drainage into trench excavations is expressly prohibited.

### 3.09 FENCING, BRIDGING AND DECKING

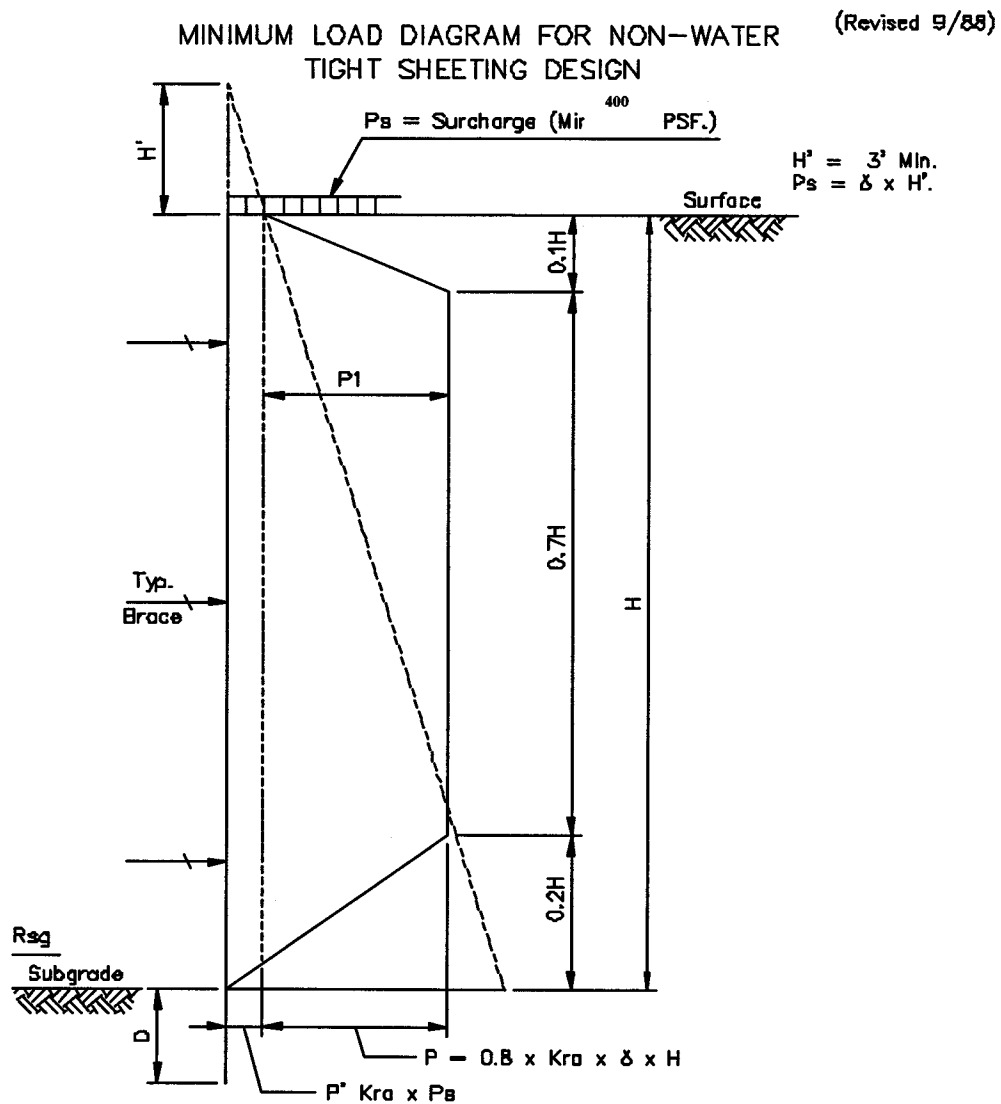
- A. All excavations or openings made under this Contract in any public street, park or place, or in any adjoining property, shall be immediately enclosed by a guard fence constructed in a neat and workmanlike manner in accordance with the requirements of Section 02821 - Metal Fence.
- B. Wherever a driveway occurs, construct a bridge of adequate strength and width and provide with side railings to span the excavation.
- C. Wherever the distance between available crossings over the excavation is, in the opinion of the Resident Engineer, excessive, he may order a temporary footbridge with side rails to be constructed.



- D. At all street intersections, excavations made from the surface shall be decked over in a substantial manner so that traffic can be maintained at all times except as herein provided for. The removal of the pavement and the placing of the decking shall be done during the hours of a day or night that will cause the least inconvenience to adjoining property owners and to public traffic in general. During certain designated hours of the day or night, sections of planking not more than ten feet in length may be temporarily removed for the purpose of removing excavated material, receiving materials of construction or for backfilling.

(No Further Text on this Page)

## Attachment A



$\delta$  = Unit Weight of Soil

$\delta_w$  = Unit Weight of Water

$\delta_s$  = Unit Weight of Submerged Soil

$\phi$  = Angle of Internal Friction of Soil

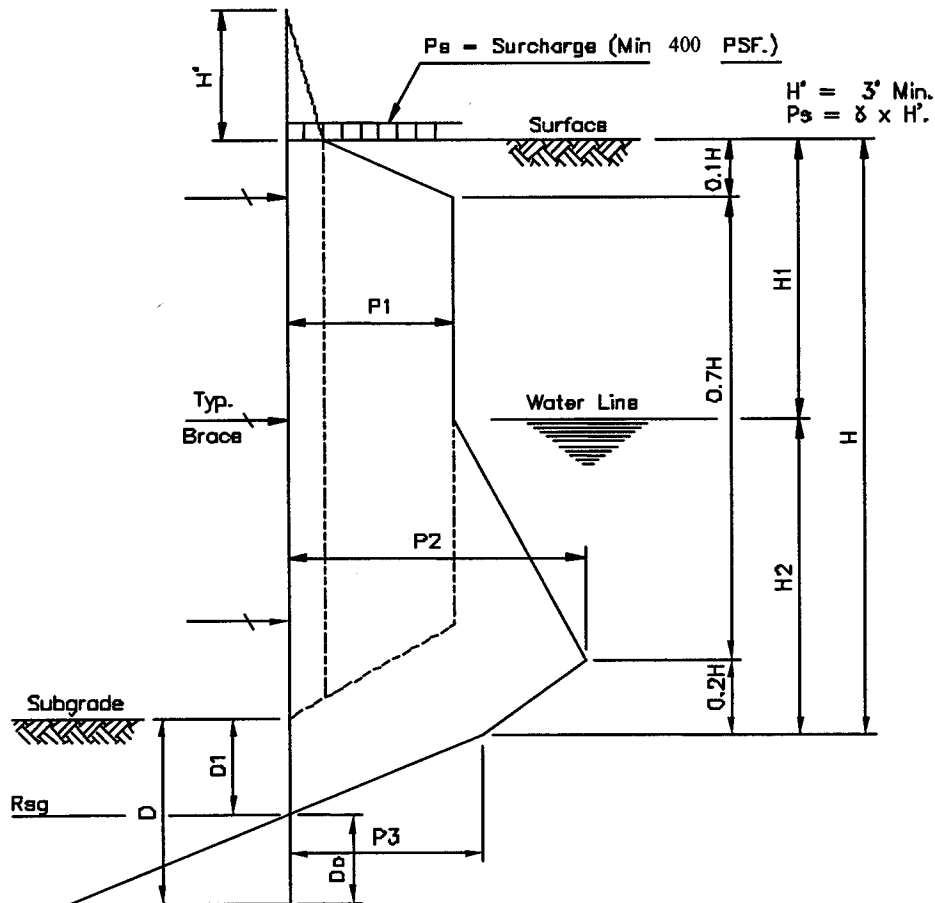
$K_{ra} = \frac{(1 - \sin \phi)}{(1 + \sin \phi)}$  For Active Earth Pressure

$K_{rp} = \frac{(1 + \sin \phi)}{(1 - \sin \phi)}$  For Passive Earth Pressure

$D = \sqrt{\frac{2 R_{sg}}{\delta (K_{rp} - K_{ra})}}$  (1.3)  
(Min. 2'-0")

## Attachment B

(Revised 9/88)

MINIMUM LOAD DIAGRAM FOR WATER  
TIGHT SHEETING DESIGN

$$\begin{aligned}
 P' &= K_{ra} \times P_s \\
 P_1 &= P' + 0.8 \times K_{ra} \times (\delta H_1 + \delta_w H_2) \\
 P_2 &= P_1 + \delta_w (H_2 - 0.2H) \\
 P_3 &= \delta_w \times H_2 \\
 D_1 &= \frac{P_3}{\delta_s (K_{rp} - K_{ra})} \\
 D_o &= \sqrt{\frac{2 R_{sq}}{\delta_s (K_{rp} - K_{ra})}} \\
 D &= (D_1 + D_o) (1.3)
 \end{aligned}$$

-END OF SECTION-

**Section 02317  
BACKFILLING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Backfilling work includes furnishing, placing and compacting all fill material necessary to bring excavations and site work to final grade as shown, specified or required.
- B. Materials from on-site excavation shall not be used for fill of any type. All fill material shall be imported at no additional cost to the City.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02371 - Dust, Soil Erosion and Sedimentation Control
- C. Section 02741 - Asphaltic Concrete Pavements
- D. Section 03300 - Cast-in-Place Concrete

**1.03 PAYMENT**

- A. The cost of all backfilling shown on the Contract Drawings and necessary to complete the work shown and specified shall be included in the lump sum prices bid for Bid Items 1, 2, and 3.
- B. The cost of additional select fill material and additional common fill material shall be paid as described in Section 01270 - Measurement and Payment.

**1.04 REFERENCES**

- A. ASTM C131 - Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- B. ASTM C143 - Slump of Portland Cement Concrete
- C. ASTM C330 - Lightweight Aggregates for Structural Concrete
- D. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils
- E. ASTM D698 - Test Method for Laboratory Compaction in Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))

- F. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- G. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft)
- H. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- I. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- J. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with Section 01330 - Shop Drawings.
- B. Name and location of all suppliers.
- C. Certificate of compliance with standard specified for each source of material.
- D. Prior to stockpiling or placing of select fill materials at the job site, submit for approval approximately 100-pound samples representative of the fill at the proposed borrow source. In addition, submit documentation of the availability of the required fill quantities at any proposed borrow source.
- E. Submit optimum moisture - maximum density curves and reports for all fill material before placement of fill.
- F. Results of all compaction tests for fill placement.
- G. Certification by the lightweight fill producer of the gradation, dry loose unit weight, dry compacted unit weight and Los Angeles Abrasion Test loss for the proposed lightweight fill source.

#### 1.06 QUALITY CONTROL

- A. Testing: The Contractor shall retain the services of an independent materials testing laboratory to perform the following laboratory and field tests.

- B. All materials used in construction shall be tested for optimum moisture-maximum density curve, and reports of the test results for each source shall be submitted promptly. The tests shall be as follows:

Test	ASTM Standard	Tests Per Volume Delivered
Gradation	D422	1 per 200 C.Y.
Compaction or Density	D1557	1 per 200 C.Y.

- C. Acceptability of completed compaction shall be demonstrated by tests performed by the Contractor and accepted by the Resident Engineer. The minimum number of tests shall be determined by quantity of material placed, and reports of the test results shall be submitted promptly. The Contractor shall perform either of the following tests subject to the approval of the Resident Engineer:

Test	ASTM Standard	Tests Per Volume Placed
In-Place Density	D2167 D2922	1 per 200 cy delivered

#### 1.07 DELIVERY AND STORAGE

- A. Materials delivered to the site shall be stored in a manner to prevent contamination and segregation. Segregated or contaminated material will not be permitted to be placed as backfill.

### PART 2 PRODUCTS

#### 2.01 BACKFILL MATERIAL - GENERAL

- A. Backfill with sound materials, free from waste, organic matter, rubbish, boggy or other unsuitable materials.
- B. Materials Requirements: Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the Resident Engineer for the appropriate test method where more than one compaction test method is specified.
- C. Wet and Frozen Materials: Do not use wet or frozen material for backfilling.

#### 2.02 DRAINAGE FILL

- A. Materials for Drainage Fill: Use clean gravel, crushed stone, or other suitable material conforming to the gradation specified for drainage fill. Clay and fine particles are unacceptable in drainage fill. Provide drainage fill that complies with the following gradation limits:

U.S. Standard Sieve	Percent Passing By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	45-65
#4	5-15
#16	0-4

### 2.03 SELECT FILL

- A. Materials for Select Fill: Use gravel, crushed stone, limestone screenings or other granular or similar material as approved which can be readily and thoroughly compacted to not less than 95 percent of the maximum dry density obtainable by ASTM D1557.

1. Provide select fill that complies with the following gradation limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Very fine sand, uniformly graded sands and gravels, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

### 2.04 COMMON FILL

- A. Material for Common Fill

1. Material from on-site excavation shall not be used as common fill. Import whatever fill material is required which conforms to the specifications, at no additional cost to the City.
2. Provide fill material that can be readily compacted to not less than 90 percent of the maximum dry density obtainable by ASTM D 1557 and that does not contain any unsuitable material. Select fill may be used as common fill at no change in the Contract Price.

- B. Granular Materials: Granular material that complies with the following gradation limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing By Weight
3 inch	100
#10	50-100
#60	20-90
#200	0-20

- C. Cohesive Materials: Cohesive material may be used as common fill as follows:

1. The gradation requirements do not apply to cohesive common fill.
2. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20, as determined by ASTM D4318.

- D. Material Approval: All material used as common fill is subject to approval by the Resident Engineer.

## 2.05 PIPE BEDDING

- A. Gradation for All Piping: Use a well graded material of which 90 percent will be retained on a No. 8 sieve, 100 percent will pass a 1-inch sieve, and will be well graded between those limits.

## 2.06 LIGHTWEIGHT FILL

- A. Lightweight fill shall be a lightweight aggregate produced by the rotary kiln method and meeting the requirements of ASTM C330. No byproduct slags or cinders are permitted.
- B. The material shall meet the grading requirements of ASTM C330, Table 1, Coarse Aggregate: 3/4 inch to No. 4.
- C. Dry loose unit weight shall be a maximum of 55 pcf. Dry compacted unit weight shall be a maximum of 60 pcf when measured by a one-point test performed in accordance with ASTM D698.
- D. Maximum Los Angeles Abrasion Test loss of 50 percent when tested in accordance with ASTM C131 (B grading).



## PART 3 EXECUTION

## 3.01 GENERAL

- A. Backfill all excavations to the original surface of the ground or to such other grades as may be shown or required. Obtain approval for the time elapsing before backfilling against recently constructed masonry structures. Remove from all backfill, and from the space being backfilled, any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces before backfilling is started. Leave sheeting and bracing in place or remove as the work progresses, while conforming to Section 02316.
- B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified provided the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.
- C. Dust, Soil Erosion and Sedimentation Control: The Contractor's operations shall conform to the requirements of Section 02371 - Dust, Soil Erosion and Sedimentation Control.
- D. Testing: No material shall be placed until satisfactory test reports for material type and compaction requirements have been approved by the Resident Engineer.

## 3.02 ELECTRICAL DUCT AND STRUCTURE BEDDING

- A. Bedding Placement and Compaction: All electrical ducts and precast manhole bases shall be bedded in well graded, compacted, select fill material. Select fill shall be placed in uniform layers not greater than 9 inches in loose thickness and compacted in place with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D1557. Bedding thickness shall be not less than 6 inches after compaction. Bedding below electrical ducts shall extend the full width of the trench.
- B. Bedding of Existing Facilities: Bed existing underground structures, tunnels, conduits and pipes crossing the excavation with compacted select fill material. Place bedding material under and around each existing underground structure, tunnel, conduit or pipe and extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.
- C. Concrete Work Mats: Cast-in-place manhole bases and other foundations for structures shall be cast against a concrete work mat in clean and dry excavations, unless otherwise shown, specified or required.

### 3.03 PIPE BEDDING AND INITIAL BACKFILL

- A. Hand Placement: Place select fill by hand for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D1557.
- B. Stone Placement: Do not place stone fragments larger than 2-inch size in the pipe bedding or in the backfill to 1 foot over the top of pipes, nor any stone fragments larger than 3-inch size nearer than 2 feet from any pipe, conduit or concrete wall.
- C. Disallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, or other materials that have a tendency to flow under pressure when wet, is unacceptable.

### 3.04 BEDDING PLACEMENT AND BACKFILL FOR PIPE IN SHORT TUNNEL

- A. Bed pipelines or electrical ducts placed in short tunnels in select fill or 2500 psi concrete. Completely fill the remainder of the annular space between the outside of the pipe wall and the tunnel wall with select fill, suitable material, or 2500 psi concrete, as approved. Pipes and ducts in short tunnels shall be supported to permit placing and compaction of backfill.

### 3.05 TRENCH BACKFILL

- A. General: Backfill trenches from 1 foot over the top of the pipe, from the top of electrical duct bedding or as shown to the bottom of pavement base course, subgrade for lawns or lawn replacement, to the top of the existing ground surface or to such other grades as may be shown or required. Backfill trenches as soon as, in the opinion of the Resident Engineer, it can be done without injury to the concrete or pipelines.
- B. Materials: Provide select fill, or other suitable material, as specified and as approved for trench backfill.
- C. Depth of Placement
  - 1. Except under pavements, walkways, railroad tracks, and street or highway appurtenances, or as otherwise specified, place trench backfill in uniform layers not greater than 9 inches in loose thickness and thoroughly compact in place using suitable mechanical or pneumatic equipment. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D1557.
  - 2. Traffic Areas and Under Utilities: Where pavements, walkways, railroad tracks and street or highway appurtenances are to be placed over trenches and

under utilities or utility services crossing the trench, provide trench backfill using select fill placed in uniform layers not greater than 9 inches in loose thickness and thoroughly compacted in place with equipment as specified above. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D1557.

3. Undeveloped Areas: In undeveloped areas and where select fill material or hand-placed backfill are not specified or required, place suitable backfill material in lifts not exceeding 12 inches in loose thickness. When the trench is full, consolidate the backfill by jetting, spading, tamping or puddling to ensure complete filling of the excavation. Mound the top of the trench approximately 12 inches to allow for consolidation of backfill.
- D. Dropping of Material on Work: Backfill trenches in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.
- E. Distribution of Large Materials: Break up lumps and distribute any stones, pieces of crushed rock or lumps that cannot readily be broken up, throughout the mass so that all interstices are solidly filled with fine material.
- F. Temporary Bulkhead for Trenches: Retain backfill in trenches by temporary bulkheads only and remove them as the backfilling progresses. Do not make bulkheads of stone.
- G. Sewers Not to be Covered: Do not cover sewers, drains, basin connections, ends of sewers and branches until the Resident Engineer orders or gives permission to backfill.
- H. Temporary Pavement: After completion of backfilling in City streets, remove all surplus material, and regrade and leave free, clear, and in good order all roadways and sidewalks. Deposit and compact a temporary surface of asphalt, or other equivalent and suitable material to a depth of six inches on all backfilled areas where ordered by the Resident Engineer in writing. Until areas are restored to their original condition, maintain the surface of the temporary pavement in good and safe condition and promptly fill all depressions caused by settlement of the backfill with the temporary surfacing materials and compact the same. Wet the temporary surface by spraying with water when necessary to prevent a dust nuisance.

### 3.06 STRUCTURE BACKFILL

- A. General: Backfill excavations as soon as, in the opinion of the Engineer, it can be done without injury to the concrete or structures.

- B. Use of Select Fill: Use select fill underneath all structures, and adjacent to structures where pipes, connections, electrical ducts and structural foundations are to be located within this fill. Use select fill beneath all pavements, walkways, and railroad tracks, and extend to the bottom of pavement base course or ballast.
1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.
  2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D1557.
- C. Use of Lightweight Fill: When specified, shown on the Contract Drawings, or approved by the Engineer, lightweight fill shall be used to raise the grade in areas that are to support pavements, walkways, railroad tracks and other structures.
1. Place lightweight fill in uniform horizontal layers not greater than 12 inches in loose thickness.
  2. Lightweight fill shall be compacted by four complete coverages with an approved smooth drum vibratory roller having a minimum static weight of 14,000 pounds, a minimum dynamic force of 23,000 pounds, and a total force not less than 5,500 pounds per foot of compactor drum width.
- D. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.
1. Extend such backfill from the bottom of the excavation or top of bedding to the underside of the lawn mix for seeded, sodded or hydroseeded areas, the top of previously existing ground surface or to such other grades as may be shown or required.
  2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.
  3. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D1557.
- E. Use of Cohesive Material: In unpaved areas adjacent to structures, for the top 1 foot of fill directly under the lawn mix, use cohesive backfill conforming to Paragraph 2.04C, placed in 6-inch lifts. The cohesive backfill shall extend to the limits of the excavated area. Compact to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

- F. Backfilling Around Sheet piling: When sheet piling is withdrawn, solidly fill all cavities in or adjoining the trench or other excavation. When sheet piling is left in place, solidly fill all cavities behind such sheet piling.

### 3.07 DRAINAGE BLANKET

- A. Provide a drainage blanket consisting of drainage fill where shown, specified, or required. Place drainage fill in uniform layers not greater than 8 inches in loose thickness.
- B. Where drainage fill is required underneath structures or adjacent to structures where pipes, connections, electrical ducts and structural foundations will be located within the fill, compact the fill with suitable mechanical or pneumatic equipment to not less than 95 percent of the maximum dry density as determined by ASTM D1557.
- C. Where drainage fill is required in areas not specified in Paragraph 3.07B, compact with suitable mechanical or pneumatic equipment to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

### 3.08 EARTH EMBANKMENTS

- A. Make all earth embankments of approved cohesive common fill material.
- B. Place fill in uniform layers not greater than 10 inches in loose thickness. Compact in place with suitable approved mechanical equipment.
- C. Compact earth embankments to not less than 90 percent of the maximum dry density as determined by ASTM D1557.
- D. Do not use cohesionless, granular material as earth embankment backfill, unless otherwise shown or required.

### 3.09 COMPACTION EQUIPMENT

- A. Equipment and Methods: Perform all compaction with suitable approved equipment and methods.
- B. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use hand held pneumatic tampers elsewhere for compaction of cohesive fill material.
- C. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.
- D. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

### 3.10 FINISH GRADING

- A. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown on the Contract Drawings and blend into conformation with remaining natural ground surfaces.
  - 1. Leave all finished grading surfaces smooth and firm to drain. Areas shall be finished to the degree obtainable by either blade or scraper operations and suitable for application of topsoil.
  - 2. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.
  - 3. Areas which are anticipated to be undisturbed for a period of more than 30 days shall receive temporary seeding of rye grass at a rate of three bushels per acre, weather and season permitting. This seeding shall be repeated as necessary to maintain a continuing ground cover.
- B. Surface Drainage: Grade outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

### 3.11 INSPECTION AND TESTING OF BACKFILLING

- A. Provide sampling, testing, and laboratory methods in accordance with ASTM D1556 or other method as determined by the Resident Engineer for select fill and common fill. Lightweight fill shall be tested as described in Paragraph 2.06C in accordance with ASTM D698. Subject all backfill to these tests to the satisfaction of the Resident Engineer. These tests shall be the basis for acceptance or rejection by the Resident Engineer of the compaction. Failure to achieve the specified densities shall require the Contractor to recompact or remove the material as required.

### 3.12 CORRECTION OF WORK

- A. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and recompaction in place prior to placement of a new lift. The Contractor shall, if necessary, increase its compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the lift thickness. The Contractor shall adjust the moisture content of the soil to bring it to the optimum range by drying or adding water, as required.
- B. Responsibility for Aftersettlement: Correct any depression that may develop from settlement in backfilled areas within one year after the work is fully completed. Provide, as needed, backfill material, pavement base replacement, permanent

pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

-END OF SECTION-

**Section 02325**  
**DREDGING AND DREDGED MATERIAL DISPOSAL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Character of Materials
- B. Dredge and Dredged Material Disposal Plan
- C. Dredging Procedure
- D. Dredge Equipment
- E. Dredge Areas
- F. Dredging of Contaminated Material
- G. Hydrographic Surveys
- H. Examination and Acceptance

**1.02 RELATED SPECIFICATIONS**

- A. Section 02222 – Demolition and Removals
- B. Section 02224 – Removal of Arsenic Impacted Wood-Environmental Requirements

**1.03 MEASUREMENT AND PAYMENT**

- A. The total estimated amount of material to be removed from within the specified limits, including side slopes, including over-depth and additional allowance, is shown on the Bid Form. The quantity listed is only an estimate. The Contractor shall complete the work specified whether the quantities involved are greater or less than those estimated. No separate payment will be made for disposal of debris encountered with the dredge material.
- B. Measurements for payment will be by comparison of pre- and post dredge surveys in accordance with Article 3.07, "Pre-Dredge and Post-Dredge Surveys" and Article 3.10, "Final Examination and Acceptance". To cover unavoidable inaccuracies of dredging processes, material actually removed to a maximum depth of 2 feet below the depth specified and within the dredging limits will be measured and paid for at full contractual unit price. Material dredged beyond the allowable overdepth will not be estimated and will not be included in the measurement of work.
- C. Units of measurement for dredging work specified will be cubic yards.
- D. Material actually removed within limits approved by the Commissioner shall provide for final side slopes not flatter than those indicated on the plans and will be estimated and paid for. Do not dredge outside the pay slope defined on the Contract Drawings. In computing the limiting amount of side slope dredging, net dimension without allowance for overdepth will be used. Side slopes are given for pay purposes only and are not necessarily the angle of repose of the sediment. Sloughing side slopes will not be the basis for claims against the City of New York.



End slopes, where indicated on the plans shall be treated in the same manner as side slopes.

- E. The Contractor shall pay dredged material disposal and debris disposal charges and include them in his corresponding price bid for dredging. Submit to the City of New York proof of release of liability of the dredge material. No separate payment will be made for disposal costs.
- F. Payment for all work performed under this Section will be determined by the actual measured quantity of acceptable dredging performed under this Contract. The basis for payment shall be the actual measured quantity of acceptable dredging, delineated by the specified unit of measurement, multiplied by the corresponding contractual unit price shown on the Bid Form.
- G. Dredging conditions described herein and indicated on the Contract Drawings describe conditions which are known. However, the Contractor is responsible for other conditions encountered which are not unusual when compared to conditions recognized in the dredging business as usual in dredging activities such as those required under this Contract.

#### 1.04 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, equipment and incidentals required to perform the pre-dredge survey, the sediment sampling, sediment testing, the sediment analysis, the dredging dredged material transportation, dredged material disposal, and post-dredge survey as shown and specified in the Contract Plans and Specifications.
- B. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- C. Comply with all applicable Federal, State and Local laws and regulations.

#### 1.05 DEFINITIONS

- A. Hard Material: Material requiring special equipment for economical removal, and includes boulders or fragments too large to be removed in one piece by the dredge.
- B. Contaminated Material: Material unsuitable for open water disposal. For a description of the contamination levels in this dredge material, refer to Summary of Sediment Sampling at Department of Sanitation, MTS Conversion Program Sites, dated May 2004 as submitted to NYSDEC by HydroQual, Inc. Based on the environmental reports developed to date, it is estimated that the dredge material will be classified as type C. In addition, it can be expected that the dredge equipment will recover creosote pile remnants.

- C. Debris: Any non-sediment material such as wooden pile remnants, revetment stone (riprap), logs, driftwood, wire, cable, anchors, lumber, trash, etc.
- D. Maximum Pay Depth: The required dredge depth plus the overdredge allowance for this project. All material actually removed within the required dredge prism plus any material removed within the 2-foot allowable overdredge zone will be paid for. No over-depth dredging will be paid for material removed below the required dredge prism side slopes. Dredging beyond the maximum pay depth will not be paid.
- E. Overdepth Allowance: An additional increment of depth below the required dredging depth to account for dredging inaccuracies of the dredging operation. A 2-foot overdepth allowance has been established for this project to ensure the removal of all the material within the required dredge prisms. The 2-foot overdepth is shown on the Contract Drawings.

#### 1.06 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 – Shop Drawings:
  - 1. The Contractor shall submit three (3) copies of a Dredge and Disposal Plan to the Commissioner within ten (10) days after Notice to Proceed, for approval. The plan shall detail the order and dates for completion and/or removal of each dredge area, disposal of dredged material and debris, and the plan shall include the following:
    - a. The proposed methods, equipment and schedule to dredge, transport and dispose of the dredged materials from the dredge area.
    - b. The proposed methods, equipment and schedule for removal, transport and disposal of debris from each dredge areas.
    - c. The proposed hydrographic survey equipment, methods and personnel for progress surveys.
    - d. Special procedures for dredging near structures.
    - e. Layout site locations, equipment laydown areas and equipment storage areas.
    - f. Silt curtain configuration and details.
  - 2. Shop Drawings
    - a. Soundings or Sweepings: Submit drawings of surveys by soundings or sweepings during progress of work.

- b. Dredge and Auxiliary Floating Plant layout shall be in accordance with Paragraph 3.02A.
- 3. Certificates: Protection plan, submit a plan for protection of surrounding structures, equipment, and vessels.
- 4. At least 75 calendar days prior to the start of dredging, submit three (3) copies of documentation required by the Special Conditions of the permit, including:
  - a. Pre-dredge and post-dredge survey plans and results.
  - b. Sediment sampling plan, analysis plan, results and existing sediment sampling data.
  - c. Sampling results:
    - (1) Bulk sediment chemistry and grain size analysis
    - (2) Testing required for dredge deposition at an upland location
  - d. Estimate of amount of material to be dredged based on pre-dredge survey.
  - e. Site plan and cross sections showing and clearly labeling mud lines, proposed dredge line and all other pertinent information.
  - f. Name and address of dredged material placement location, and letter of acceptance from the named facility certifying that all requirements have been met to allow the facility to accept material dredged from project site. List of all sampling, testing and analysis requirements for the named location.
- B. Submit an Environmental Protection Plan describing proposed methods, schedules and materials for implementing the environmental protection requirements. The Environmental Protection Plan shall be submitted at least 30 calendar days prior to starting the dredging operations.
- C. Daily Report of Operations: Submit in accordance with the requirements of Paragraph 3.09A.

#### 1.07 SITE CONDITIONS

- A. Surveys shown in the Plans were conducted on the date indicated therein. The City of New York will perform a preconstruction sounding survey of the site to establish pre-dredging depths for the purpose of measuring quantities for payment.
- B. In formulating his bid, the Contractor shall examine the subsurface exploration logs and reports listed in Article 1.08, "Character of Materials", herein and evaluate the

character of the materials as they may affect his operations and the means and methods available to accomplish the work.

- C. In formulating his bid, the Contractor shall examine the site of the work, including the disposal sites, and evaluate all site conditions as they may affect his operations and the means and methods available to accomplish the work. Seasonal environmental conditions exist that could influence the work. The Contractor shall examine information contained herein and evaluate the environmental conditions as they may affect his operations and the means and methods available to accomplish the work

## 1.08 CHARACTER OF MATERIALS

### A. General

1. It is the Contractor's responsibility to evaluate and establish the consistency of the materials to be dredged. The City of New York and the Commissioner shall not at any stage be held responsible for any of the information provided and/or for the interpretation of the data provided. It is the Contractor's responsibility to satisfy itself to the nature of the work and the quality of the material to be dredged.
2. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available as described in Section 01120 – Contract Summary. The Contractor may use this report to establish the quality of materials expected to be present at the project site. The Contractor shall satisfy itself whether the investigations are sufficient to determine the nature of the work and the quality of the material to be dredged. If the Contractor finds that the investigations are not sufficient to determine the nature of the work and the quality of the material to be dredged, he can undertake his own investigations before submission of his bid at his own expense.
3. Typical soils to be dredged include, but are not limited to, sands, silts, and clays. Unified Soil Classification System classifications include SP-SM, SM, CL, CH, ML, MH, OL, OH. Other types of soils may also be encountered.

### B. Available Geotechnical Reports

Title	By	For
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

## 1.09 ARTIFICIAL OBSTRUCTIONS

- A. The City of New York has knowledge of debris such as, but not limited to, metal bands, pallets, pieces of broken cable, rope, fire hose, and broken piles (creosote). The City of New York has no knowledge of existing wrecks, wreckage, or other material of such size or character as to require the use of explosives or special or additional plant for its economical removal. Debris removed from the dredged area shall be removed from the water. Disposal shall be the responsibility of the Contractor and disposal shall be outside the limits of City of New York property. Refer to Section 01733 – Construction Waste Management, Section 02224 – Removal of Arsenic Impacted Wood – Environmental Requirements and Paragraph 3.01J for disposal requirements of creosoted wood.
- B. There are several areas where dredging is required in close proximity to existing wharf structures and piers. Dredging shall also be performed adjacent to the new king pile bulkhead which must be constructed under this Contract prior to the dredging. The Contractor shall conduct dredging operations in the dredge area in such a manner to prevent undermining or endangerment of the existing and new adjacent structures. Excessive or unnecessary dredging may result in an unstable condition at the toe of the structures. It shall be the Contractor's responsibility to avoid damage to existing structures and to improvements made under this Contract. The Contractor shall strictly adhere to the indicated dredging template when working near any structures, and shall be responsible for repairing any damage which may result from failure to comply with the requirements of these specifications, at no additional cost to the City of New York.

## 1.10 PERMITS

- A. The Contractor shall comply with conditions and requirements of the Corps of Engineers Permit and other Local, State or Federal permits. The Commissioner will secure the permit for dredging of dredged material as indicated. The Contractor shall make his/her own arrangements for disposal of dredged materials and debris. The Contractor shall undertake all required debris removal, dredging, handling, transportation and disposal in accordance with the permit requirements.
- B. The Contractor shall comply with the permit issued by the New York State Department of Environmental Conservation (NYSDEC) and the Army Corps of Engineers. These permit conditions can be different (more stringent) than the requirements listed in this Section. The Contractor shall base his price bid on the most stringent requirements.

## 1.11 ENVIRONMENTAL PROTECTION REQUIREMENTS

- A. Provide and maintain during the life of the contract, environmental protective measures. At all times, provide environmental protective measures required to correct conditions, such as spills of oil, fuel, bituminous materials, calcium chloride, salts, acids, bases or other harmful materials. or debris that occur during

the dredging operations. Comply with Federal, State, and local regulations pertaining to water, air, and noise pollution. Seasonal restrictions for dredging (blackout periods) are applicable to dredging at the project site. It is the responsibility of the Contractor to investigate and comply with all applicable local and national laws concerning pollution of the water. All Work performed under this Contract shall be performed in such a manner that objectionable conditions will not be created in the water at or adjacent to the Project area.

- B. It is the Contractor's responsibility to assess if he requires specialized equipment, protective clothing, etc. in addition to the requirements listed in the specifications for handling contaminated dredge materials. Refer to Section 01355 – Regulated Materials Control and Section 01356 – Safe and Healthful Working Conditions

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 GENERAL DREDGING PROCEDURE

- A. The overall purpose of the dredging is to deepen the areas in front of the new Marine Transfer Station to provide access to this new station for a range of barges and tow tugs.
- B. The Contractor shall adhere to the overall construction schedule and complete the dredge area in accordance with the milestone dates. The Contractor shall adhere to seasonal restrictions for dredging periods in accordance with the permits.
- C. Dredging shall be carried to lines, depths, and tolerances as indicated on the Contract Drawings and as directed by the Commissioner. The Commissioner may change the lines and depths shown in the Contract Drawings. If such changes increase or decrease quantity of dredging, such revised quantities will be used as basis for payment under unit price for dredging element involved. Dredging work carried out beyond the maximum overdepth allowance given shall be considered excessive dredging and, if required by the Commissioner, the Contractor shall, at his/her own expense, be responsible for back filling these areas to elevations and with materials specified by the Commissioner.
- D. The Contractor shall establish a minimum of two (2) survey control points along the shore to provide horizontal and vertical survey control. Survey control points that are damaged by the Contractor's activities shall be re-established at the cost of the Contractor.
- E. Dredging shall be done with a mechanical clamshell dredge, using an environmental bucket. Barge overflow will not be allowed. However, the Contractor may leave the material on site in the barges and have it settle over time and then pump out the decant water into the surrounding water body, provided the Contractor obtains all applicable permits and approvals for discharging the decant

water. This will require the Contractor to provide additional barges for settlement of the dredge material.

- F. Any material that escapes or is lost at any time while dredging, loading, transporting, or which is deposited other than in an area designated on the Contract Drawings, or change approved in writing by the Commissioner, shall be re-dredged, and material shall be re-deposited where directed by the Commissioner, at the Contractor's expense.
- G. The Contractor shall provide for the safe transportation and disposal of dredged materials. Transport and dispose of dredged materials at an approved disposal area. The Contractor shall verify the availability of the selected disposal site to accept dredged material at the time the work is performed and comply with any sampling, testing, analysis or other requirements of the disposal facility. Disposal at locations in New Jersey requires the Contractor to obtain an Acceptable Use Determination (AUD) from the New Jersey Department of Environmental Protection.
- H. The Contractor shall meet all local, state and federal laws, regulations and permit requirements applicable to dredging and disposal operations. The Contractor shall prepare and submit the materials listed in paragraph 1.06A.4 in accordance with the permit documents, which include a sediment sampling plan. The Contractor shall implement the plan and submit the results to the Commissioner for review by NYSDEC. If the results differ significantly from those of the sampling report cited in paragraph 1.05B, dredging, transportation and disposal operations may be impacted. Should this occur, such findings may be considered as Changed Conditions.
- I. Excessive loss of water, sediment or both from the time the bucket breaks the water's surface to the time it crosses the barge gunwale is not permitted. This means the environmental bucket should be in good working order throughout construction.
- J. Creosote piles are considered "hazardous waste" and shall be disposed off at a Land Disposal Restrictions (LDR) facility landfill that is approved to accept RCRA hazardous waste.
- K. The Contractor shall use silt curtains in conformance with permit requirements. Silt curtains shall be deployed to enclose the area being dredged and the bucket swing area. Also, silt curtains shall be inspected daily to ensure proper alignment and function. If silt curtain is damaged, dredging operations shall cease until necessary repairs are completed.

L. Dredging operations shall be conducted in such a manner as to minimize water quality impacts:

1. Bucket hoist speed limited to approximately 2 ft/second.
2. Bucket lowered to level of barge gunwales prior to release of load.
3. No barge overflow is allowed. See Paragraph 3.01E.

### 3.02 EQUIPMENT

- A. The Contractor shall, at all times during the progress of the works, provide, operate and maintain in proper working conditions the necessary dredges and plant, barges, tugs and other floating craft and boats, surveying equipment and sounding equipment necessary for the execution and completion of the works. The capacity of the dredging plant shall be such as to allow completion of the dredging work within the Construction Schedule with reasonable margins for downtime due to breakdowns, bad weather and interruptions arising from plant movements. The Contractor shall submit three (3) copies of the Dredge and Auxiliary Floating Plant Layout describing the plan layout of the dredge and major auxiliary floating plants, and Dredge and Disposal Plan to the Commissioner for approval. The plan shall include locations of engines and fuel storage, engine types, power ratings, electrical rooms, transformer rooms, emergency generating equipment, and vertical and horizontal access. Upon approval, the plan shall be furnished to the local police, Port Police, Federal Aviation Authority, U.S. Coast Guard and local fire departments by the Contractor.
- B. The Contractor's equipment shall be of sufficient size and quantity to meet productivity requirements of the Work and shall meet regulatory emission standards, and shall be kept in good working order to efficiently perform the Work. Promptly detect and repair leaks or breaks on haul barges or other dredged material conveyances. Remove dredged material placed due to leaks and breaks.
- C. Display System: The Contractor shall install and maintain sensors and related instrumentation to measure and display depth of dredge(s) to be used for excavation work. A display system capable of displaying to the operator in real-time the cross section on which dredge is working, including original ground line, design depth, and position of bucket, shall be installed and maintained.
- D. The Contractor shall make all arrangements and pay all costs associated with meeting applicable regulations and permit requirements of all City, State and Federal authorities.
- E. The Contractor shall install and maintain a positioning system with capability of providing horizontal and vertical control for dredging and surveying operations. Survey system shall be compatible with system employed by the City of New York.



- F. The Contractor will be required to use settlement basins or other devices or construction methods to maintain compliance with regulatory requirements per the permit conditions for dredging and rock armor and underlayer placement activities.
- G. The Contractor shall use an environmental clamshell bucket per the permit conditions except for dredging hard material. The environmental bucket is defined as a bucket constructed with sealing gaskets or overlapping sealed design at the jaws. The bucket shall be equipped with a signal light in the control station, to verify bucket closure and seal.
- H. Use of the environmental bucket shall be done to the point of refusal to meet grade. If native dredge material cannot be removed with an environmental bucket, a suitable open clamshell capable of removing hard material shall be employed after reaching refusal on the environmental bucket. Application of a bucket other than an environmental bucket requires approval of NYSDEC.
- I. The material shall be placed and transported in solid hull scows or concrete sealed scows.

### 3.03 ENVIRONMENTAL DREDGE WINDOWS

- A. The following table provides an overview of the seasonal dredge restrictions (black-out dates), no dredging allowed during the periods listed below:

**Table – Environmental windows**

<b>NYS DEC</b>	<b>US ACE</b>
November 15 – April 15 (Striped Bass/Winter Flounder)	November 15 – April 15 (Striped Bass/Winter Flounder)

### 3.04 COORDINATION AND NOTICES

- A. Prior to starting dredging the Contractor shall sent notices to:
  1. U.S. Army Corps of Engineers, New York District.
  2. New York State Department of Environmental Conservation.
  3. Pipeline, cable and utility companies in the vicinity of the dredge areas.
  4. U.S. Coast Guard
  5. City of New York
  6. Adjacent Property Owners

Copies of the letters shall be provided to the Commissioner.

- B. It shall be the responsibility of the Contractor to fully coordinate all work with all other contractors, the Port Authority of New York & New Jersey, New York City and all other personnel working in the project vicinity. If there is a coordination

problem arises, the Commissioner shall be immediately notified and a meeting between all parties involved shall be held to resolve the coordination problem.

- C. If required by the Commissioner, the Contractor shall attend a meeting prior to start of construction activities with the City of New York, the Commissioner, U.S. Coast Guard, Port Pilots and the Port Police to outline the organization for prevention/elimination of traffic conflicts.
- D. When required, the Contractor shall provide transportation for the City of New York's Representative and inspectors and, as appropriate, personnel from authorities having jurisdiction, to and from the dredging plant.

### 3.05 NAVIGATION

- A. The Contractor's operations shall adhere to the U.S. Coast Guard publication "Navigation Rules, International-Inland", COMDTINST M16672.2D, latest edition available at [www.navcen.uscg.gov/mwv/navrules/download.htm](http://www.navcen.uscg.gov/mwv/navrules/download.htm).
- B. Minimize interference with the use of navigation channels and passages. The Contractor shall be required to conduct the work in such a manner as to obstruct navigation as little as possible, and in case the Contractor's plant or other floating plant so obstructs a navigation channel as to make difficult or endanger the passage of vessels, said plant shall be promptly moved on the approach of any vessel to such an extent as may be necessary to afford a practicable passage.
- C. No adjustment in the contract price or in time for completion will be made if dredging operations are interrupted due to the movement of vessels or floating equipment.
- D. Each night, between sunset and sunrise and during periods of restricted visibility, provide lights for floating plants, pipelines, ranges, and markers. Also, provide lighted buoys to safeguard navigation. When night work is in progress, maintain lights from sunset to sunrise for the observation of dredging operations. Lighting shall conform to United States Coast Guard requirements for visibility and color.
- E. Furnish, set, and maintain ranges, buoys, and markers needed to define the work and to facilitate inspection. Establish and maintain gages in locations observable from each part of the work so that the depth may be determined. Suspend dredging when the gages or ranges cannot be seen or followed.

### 3.06 DREDGING

- A. Purpose: Excavate river bottom sediments, organic soil, silt, and sand. The materials are unsuitable for open water disposal. Dispose of the materials at an approved disposal site.
- B. Depth and Extent of Dredging: To stations, lines, and depths as shown on plans.

- C. Sequence of Work: Material shall be removed after completion of the new east king pile bulkhead and at least 3 months prior to project completion.
- D. Restrictions: Excavation of soils shall be performed by clamshell dredge.

### 3.07 PRE-DREDGE AND POST-DREDGE SURVEYS

- A. The Contractor shall perform one pre-dredge survey for each dredge area after the award of contract and as close to commencement of dredging for each dredge area as possible, but not more than 14 calendar days prior to commencement of work.
- B. The Contractor shall notify the Commissioner not less than fourteen (14) calendar days prior to completion of the entire dredging work. The Contractor shall perform the post-dredge survey as soon as practicable after completion of the work for each complete dredge area, preferably within seven (7) calendar days after completion of the entire dredge area work.
- C. All areas found to be in compliance with the contract requirements will be measured for payment in accordance with Section 01270 - Measurement and Payment. Preliminary hydrographic survey data shall be made available to the Commissioner within ten (10) calendar days after the Contractor's survey is performed. If the preliminary survey data indicates that the dredged area is not at the required depth (within the overdredge allowance), the Contractor will be directed to resume dredging and to complete the work to project depth.
- D. The material removed will be measured by cubic yard in place, by means of soundings taken before and after dredging. Soundings shall be conducted using commercially available Automated Range-Azimuth Positioning System or Differential Global Positioning System (DGPS), in the New York State Plane Coordinate system based on NAD 83. Soundings shall be taken by dual frequency single-beam acoustic surveys (nominally 24-38 kHz and 200 kHz), with a maximum line spacing of 25 feet. Other methods such as lead line, trigonometric leveling (total station)/differential leveling, or single-beam acoustic survey methods, may be used if multi-beam method is not warranted as determined by the Commissioner. Results of soundings by any of these methods, singularly or in combination, will be the basis for payment. The Commissioner shall be notified at least seven (7) calendar days prior to conducting each pre-dredge and post-dredge survey and shall be given the option of having his representative present when such soundings are made.

### 3.08 SHOALING

- A. If, before the contract is completed, additional shoaling occurs in any dredge area, because of the natural sloughing of the side slopes or from sediments transported inside the project area, re-dredging at the contract unit price may be required as directed by the Commissioner.

### 3.09 REPORTING REQUIREMENT

- A. The Contractor will be required to prepare and maintain a Daily Report of Operations and furnish six copies thereof to the Commissioner. The daily reports shall document dredging and disposal operations for all shifts in a 24-hour period. During the performance of all dredging and disposal operations, equipment operators shall fill out a Daily Dredging Report and Leverman's Shift Log for each calendar day's activity on each dredge being operated. Forms and reporting format to be used shall be submitted to the Commissioner for approval prior to use. Forms shall be filled out completely and legibly; including signatures, using black ink. Original forms shall be given to the Commissioner by 12:00 noon on the day following date shown on reports. Daily Dredging Report shall be filled out for every calendar day and every dredge on site, even when equipment is not working.

### 3.10 FINAL EXAMINATION AND ACCEPTANCE

- A. As soon as practicable after the completion of the entire work, a final examination of the work will be conducted by the Commissioner. Should any shoals, lumps, or other lack of contract depth be disclosed by this examination, the Contractor will be required to remove same by mechanical dredge. However, if the bottom is soft and the shoal areas are small and form no material obstruction to navigation, the removal of such shoal may be waived by the discretion of the Commissioner. The Contractor or his authorized representative will be notified when hydrographic surveying will be performed, and will be permitted to accompany the survey. When the area is found to be at the required depth(s) and slope(s) within the overdredge allowances, it will be accepted finally. Should more than two sounding operations by the City of New York over an area be necessary by reason of work for the removal of shoals disclosed at a prior sounding, the cost of such third and any subsequent sounding operations will be charged against the Contractor at the rate of five thousand dollars (\$5,000.00) per day for each day in which the City of New York plant is engaged in sounding and/or is enroute to or from the site or held at or near the said site for such operations. Final acceptance of the whole or a part of the work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud, or obvious error; and the acceptance of a completed section shall not change the time of payment of the retained percentages of the whole or any part of the work.

-END OF SECTION-

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**Section 02360**  
**EXCAVATION SUPPORT AND PROTECTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to design, furnish, fabricate and install excavation support and protection systems complete in place where shown on the Contract Drawings, as specified herein, and as required to adequately protect structures and utilities from damage during construction of foundations, substructures, abutments, piers, retaining walls, bulkheads and cofferdams. The work also includes the removal of temporary excavation support and protection systems and restoration of structures and utilities to a condition equivalent to that prior to the start of the work.
- B. The work includes, but is not limited to, the following items:
  - 1. Temporary sheeting required to prevent soil erosion under existing pile-supported structures as a result of excavation operations.
  - 2. The use of tight sheeting, at the Contractor's discretion, around the general excavation perimeter to limit the quantity of water that may flow into the excavation area due to high groundwater levels that may be encountered.
- C. The Contractor shall be required to maintain the excavation support and protection system in place, and remove it from the job site only after its function has been accomplished or when directed by the Commissioner. Excavation support and protection systems may be left in place only where specifically indicated on the Contract Drawings or with the written permission of the Commissioner.
- D. This Section includes, but is not limited to, the following items:
  - 1. Unbraced sheet pile walls.
  - 2. Braced sheet pile walls.
  - 3. Soldier pile and lagging walls.
  - 4. Timber sheeting and bracing.
  - 5. Shoring and underpinning.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 – Excavation
- B. Section 02317 – Backfilling
- C. Section 05120 – Structural Steel

### 1.03 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
1. American Society for Testing and Materials (ASTM):
    - a. ASTM A36, Carbon Structural Steel.
    - b. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - c. ASTM A307, Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
    - d. ASTM A328, Steel Sheet Piling.
  2. American National Standards Institute/American Welding Society (ANSI/AWS):
    - a. ANSI/AWS D1.1, Structural Welding Code – Steel.
  3. Southern Pine Inspection Bureau (SPIB):
    - a. SPIB Grading Rules.
  4. Western Wood Products Association (WWPA):
    - a. WWPA Catalog A - Product Use Manual.
  5. City of New York:
    - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
    - b. New York City Board of Standards and Appeals, latest edition and amendments or supplements thereto.

### 1.04 DEFINITIONS

- A. Protection of Structures is defined as the provision of all necessary construction to securely support the structure being protected. Structural settlements shall be limited to the displacements specified. Protection shall include restoration of the structure upon completion of such work.
- B. Excavation support is the support system installed prior to, during and immediately following excavation, to minimize ground movement and slippage, and to maintain the stability of the excavation while constructing the structure.
- C. Restoration is defined as the correction, by repair or replacement, of portions of a structure damaged or altered as a result of the Contractor's operations. Restore to

the equivalent condition existing prior to the start of work and to the satisfaction of the Commissioner.

- D. Structures are defined as buildings, surface and underground structures, including pavements and underground pipelines and utilities that may be affected by the Contractor's operations.
- E. Displacements are defined as vertical and/or horizontal movements measured at either the exposed surface of a structure or within the soil overburden within five feet of the structure. Movements may occur as a result of the Contractor's operations prior to, during, or after installation of the excavation support system.

#### 1.05 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design, furnish, place, maintain and remove excavation support and protection system at locations required to have open excavations in operation without danger to workers or adjacent structures or facilities.
  - 1. Base design of excavation support systems on existing loads and construction conditions. Existing loads to be considered include, but are not limited to, those caused by soil pressure, hydrostatic pressure, existing structures, stored material, and moving and stationary vehicles and equipment. Design excavation supports in a manner that will permit construction to proceed, enable supports to present no threat to public safety, and protect completed work and other property from damage that would result from ground movement.
  - 2. Obtain any additional information necessary for the design including, but not limited, to soil test borings and foundation plans.
- B. The Contractor is solely responsible for the design and construction of excavation support and protection systems necessary to protect personnel, structures or utilities whether or not indicated on the Contract Drawings. The Contractor shall retain a licensed Professional Engineer registered in the State of New York to prepare, sign and seal structural design calculations and to supervise, sign and seal design drawings for each excavation support system proposed for this project for review and approval by the Commissioner.
- C. Sequence of construction, including any required excavation, filling or backfilling, shall conform to the requirements shown on the Contract Drawings and as specified in Section 02316 - Excavation and Section 02317 - Backfilling.



- D. When concrete is less than 7 days old, do not drive sheet piles closer to the concrete than the distance computed by the formula below:

$$D = 1/7 \sqrt{E}$$

Where:

E = Energy of pile hammer in foot-pounds

D = Distance in feet

- E. Conform to applicable local, State and Federal regulations for the erection of excavation support systems.
- F. Sheet piles shall not be installed until the Commissioner has approved the method of installation and the sequence of driving.
- G. Excavation support systems may be left in place only where indicated on the Contract Drawings or with the written permission of the Commissioner. Excavation support systems that retain earth on which the support or stability of existing structures or utilities is dependent or where required for safety or by governing laws, shall be left in place at the completion of work. Protect existing structures, including overhead and buried utility lines, to the satisfaction of the Commissioner.
- H. Alignment and Tolerances
1. Unless otherwise shown on the Contract Drawings, after installation, the slope of steel sheet piling shall not deviate from vertical by more than one percent.
  2. Sheet and soldier piles at cut-off elevation shall not deviate laterally from required location as required to ensure complete protection for the excavation.

#### 1.06 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
1. Shop Drawings for excavation support systems showing all proposed materials, erection details and methods of installation, including length of member, elevations of sheeting, cut-off elevations, and locations of handling holes, and proposed methods of cutting through supports where supports will be penetrated by utilities.
  2. Structural design calculations prepared for each proposed excavation support system. Calculations shall be signed and sealed by a licensed Professional Engineer registered in the State of New York.

3. Product Data: Manufacturer's descriptive product data, current specifications and installation instructions for materials or systems proposed for the work of this Section.
4. Certified mill test reports for steel sheet piles.
5. A complete description of the hammer and driving equipment including caps and guides for steel sheet piling and soldier piles.
6. Verification of welder qualifications.
7. The proposed procedure for installing the sheet piling including the sequence for driving all piles.

#### 1.07 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Provide for the protection of the public, employees and property, in accordance with applicable requirements of 29 CFR Part 1926, Subpart P, "Excavation, Trenching and Shoring", Construction Safety and Health Regulations (OSHA), which, by reference, is made a part of this specification, including sections relative to protection of the public; sheeting, shoring and bracing; and trenches and excavating.
- C. Assume all risks for the protection of overhead or underground public utility and private lines, pipes, conduits and support work, existing structures, fencing, pavements, sidewalks, and property of whatever nature.
- D. Damage to such structures or to any persons or property associated with such structures, where such structure are or are not shown on the Contract Drawings, is the responsibility of the Contractor.
- E. Pay for restoration of such damaged structures back to equivalent original condition at no expense to the City of New York.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Exercise care to avoid bending, scraping and overstressing the sheet piling and soldier piles. Block with wood or otherwise protect the sheeting and soldier piles from being bent or injured.
- B. Load, transport, unload and store sheet piling and soldier piles in such a manner that the metal is kept clean and free from injury. Store materials above ground on platforms, skids or other supports and cover and protect it from corrosion.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Steel Sheet Piling: ASTM A328/A328M, unless otherwise shown on the Contract Drawings.
- B. Sheet Piling Corners, Tees, Wyes and Crosses: ASTM A328/A328M, unless otherwise shown on the Contract Drawings.
- C. Steel Wales, Plates and Bracing: ASTM A36, unless otherwise shown on the Contract Drawings.
- D. Soldier Piles: ASTM A36, unless otherwise shown on the Contract Drawings.
- E. Bolts, Nuts and Washers: ASTM A307, galvanized to 2 oz. per square foot, in accordance with ASTM A153, unless otherwise shown on the Contract Drawings.
- F. Timber: No. 2 (No. 1 Mining) Coastal Douglas Fir, Long-leaf Southern Yellow Pine or approved equal, conforming to WWPA Catalog A or SPIB Grading Rules.
- G. Steel sheeting, waling and bracing may consist of new or used material but shall be in satisfactory condition and approved by the Commissioner. These materials shall be suitable for the intended use. The Commissioner may disapprove and reject used materials regarded to be unsatisfactory at no additional cost to the City of New York.

### 2.02 EQUIPMENT

- A. Pile Driving Equipment
  - 1. Use an approved driving head designed to properly fit a pair of piles to prevent damage to the top of the piles during driving.
  - 2. Use an approved impact or vibratory pile hammer of sufficient size to drive the sheet piles to the required depth without causing stresses in excess of 90 percent of the yield strength ( $F_y$ ) of the pile material due to driving.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Hand dig exploratory trenches where underground utility installations are known or suspected prior to placing and driving temporary sheeting.
- B. Install all necessary excavation support systems prior to commencing excavation.

- C. Shoring systems that retain earth on which the support or stability of existing structures or utilities is dependent shall be left in place at completion of work. Where required for safety or by governing regulations, and when so directed in writing by the Commissioner, leave sheeting in place. In such instances, remove original braces and re-brace sheeting against the structure in a manner approved by the Commissioner. Cut off sheeting at elevations directed by the Commissioner.
- D. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to the Commissioner.
- E. Install internal bracing, if required, to prevent spreading or distortion to braced frames.
- F. Remove excavation support in stages to avoid disturbance to underlying soils and damage to structures, tracks, pavement, facilities and utilities.
- G. Repair or replace, as directed by the Commissioner, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.
- H. Welding and Splicing
  - 1. Perform all welding in accordance with requirements for shielded metal arc welding in accordance with ANSI/AWS D1.1 for buildings and other structures.
  - 2. Only use welders qualified by tests prescribed in ANSI/AWS D1.1, as applicable.
  - 3. Reinforce pile tips, if required due to field conditions and as approved by the Commissioner.
  - 4. Except where directed by the Commissioner, splicing of sheet piles will not be permitted.
- I. Sheet Pile Driving
  - 1. Use an approved guide frame or template to set sheet piles in proper position and alignment and to provide adequate lateral support to maintain vertical alignment during driving. Where field conditions require, use two levels of guide wales to maintain vertical alignment during driving.
  - 2. Steel sheet piles shall be properly set and "shaken out" prior to driving. After placing a pair of sheets within their interlocks, they shall be lowered as far as possible. Should the sheets bind or hang up in their interlocks before bearing on the ground, adjacent sheets shall be picked up in pairs and shaken out as required, until the sheets ride smoothly within their interlocks and simultaneously bear on the ground. For cellular cofferdams, the entire cell shall be assembled prior to driving.

3. Top of sheet pile shall be normal to the driving force.
4. Drive sheet piles to the elevation(s) required to adequately support the retained earth as derived by the Contractor's licensed Professional Engineer. Each pair of sheet piles shall not be driven more than five feet ahead of the adjacent sections.
5. Sheet piles shall be driven in such a manner as to prevent piles from leaning in the direction of driving and to provide a continuous closure of sheet piles, where closure is required. Where possible, drive sheet piling with the ball end leading. If an open socket is leading, provide a bolt or similar object in the bottom of the interlock to keep the interlock free of soil material.
6. At the completion of the driving operation on a sheet pile, the installed sheet pile shall be undamaged, free of defects and in compliance with the requirements of this Section.
7. No jetting will be permitted without the specific approval of the Commissioner.

### 3.02 FIELD QUALITY CONTROL

- A. Before starting work, check and verify governing dimensions and elevations.
- B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify and record locations of benchmarks and reference to the bench marks.
- C. Construct excavation support systems in accordance with approved Shop Drawings.
- D. Maintain at all times the safety, stability and integrity of any structures and utilities of whatever nature regardless of location that might be affected.
- E. Monitoring of Adjacent Structures
  1. Perform monitoring at the beginning and end of every work shift during all phases of demolition and construction activities.
  2. Measure vertical and horizontal displacement to the nearest 0.01 feet.
  3. Monitoring of Structure Elevations and Alignments:
    - a. The displacement limits and the required action to be taken in the event a limit is reached are defined as follows:
      - (1) Displacement Limit: Zero for structures and 0.25 inches for others.

- (2) Required Action: If settlement or displacement is detected, modify or change methods of protection to cease further settlement or displacement. If settlement or displacement exceeds 0.10 inches, cease excavation and/or other construction operations that result in further settlement. Undertake appropriate measures to ensure that the integrity of the structure is maintained.
- F. Assume full responsibility for the stability of all excavation support systems and related operations.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 02364**  
**STEEL PIPE PILES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, install, drive and cut off steel pipe piles and fill with concrete where indicated, complete in place in conformity with the lines, grades, dimensions and locations shown on the Contract Drawings, the procedures and tolerances specified herein, and as required for a complete installation. The work also includes Pile Driving Analyzer (PDA) setup and testing.
- B. For the 150 ton pile only, the Contractor may elect to use an alternate type pile in lieu of the Basis of Design 20 inch diameter steel pipe pile. The alternate pile shall be a tapered pile such as Monotube, Tapertube, step-taper, or approved equivalent. This specification section shall be used if the Contractor chooses to utilize the Basis of Design 20 inch diameter steel pipe pile. If the Contractor opts to bid on the Contractor's Option composite tapered pile please refer to Section 02365 – Composite Tapered Piles, this specification section shall not apply.
- C. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- D. This Section includes, but is not limited to, the following items:
  - 1. Steel pipe piles for building, ramps, and other structures.
  - 2. Pile Driving Analyzer (PDA) setup and testing including during restrikes as specified by the Commissioner.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02456 - Pile Load Tests
- B. Section 03200 - Concrete Reinforcement
- C. Section 03300 - Cast-in-Place Concrete

**1.03 MEASUREMENT AND PAYMENT**

- A. Measurement
  - 1. Steel Pipe Piles: The quantity of steel pipe piles to be measured for payment at the unit price bid will be the actual length of piles, in linear feet, including both production and test piles incorporated in the work, driven or installed and



left in place in conformity with the Contract Drawings and the Specifications or as directed by the Commissioner.

2. The approved quantity of steel pipe piles actually incorporated in the work, delineated by the specified unit of measurement, will be the basis for payment. The linear footage of pile to be measured for payment shall be the length in place below the cutoff elevation measured to the pile tip. Any part of the pile remaining above the cutoff elevation specified or otherwise directed will not be measured for payment.
3. Pile Driving Analyzer (PDA) Load Tests: The approved quantity of PDA pile load tests actually conducted on various pipe pile sizes which are completed, documented and accepted will be the basis for payment. PDA pile load tests conducted during initial drive and conducted during redrive/restrike will be measured as separate tests.
4. Units of measurement for the work specified in this Section shall be as follows:
  - a. Steel Pipe Piles – 16-inch diameter – linear feet
  - b. Steel Pipe Piles – 20-inch diameter – linear feet
  - c. Steel Pipe Piles – 36-inch diameter – linear feet
  - d. Pile Driving Analyzer Load Tests – per each.

**B. Payment**

**1. Steel Pipe Piles**

- a. The unit price per linear foot of steel pipe pile incorporated in the work shall include the cost of furnishing, fabrication, coating, delivery, storage and handling, installation, equipment, maintaining in proper condition, removal, re-installation, obstruction removal, shoes, shop and field splices, furnishing and placement of reinforcement, furnishing and placement of concrete, and other incidentals necessary to properly perform the work complete and in place as detailed on the Contract Drawings and accepted by the Commissioner. The unit price bid for this item shall apply to both production and test piles incorporated into the work.
- b. The basis for payment shall be the aggregate measured length of approved steel pipe piling, as defined in Paragraph 1.03.A.2, for each steel pipe pile diameter actually incorporated in the work, delineated by the specified unit of measurement, multiplied by the corresponding contractual unit price shown on the Bid Form.
- c. Steel pipe piles may be added or deleted as directed in writing by the Commissioner and paid for at the contractual unit price per linear foot for the appropriate steel pipe pile diameter.

- d. No separate payment will be made for inspection of steel pipe piles, pile tips, test or index piles, removing damaged or misdriven piles, piles driven for the temporary use or for the convenience of the Contractor, pre-drilling, removal of obstructions, jetting, spudding, pile surveys and related drawings, pile cutoffs and their disposal off-site. The costs thereof shall be included in the unit price bid for steel pipe piles.
- 2. Pile Driving Analyzer Load Tests: The unit price bid per PDA load test shall include all materials, equipment, tools and labor incidental thereto, including the cost of engineering and analysis in preparation for the tests. The costs of furnishing and driving the drive-test piles will be paid under other unit price bid items as defined above.
- 3. Unacceptable Piles
  - a. Unacceptable steel pipe piles are addressed in Article 3.07.
  - b. If the Commissioner deems that the deficiency of a pile is due to Contractor operations, all costs for replacement piles or design, analysis and construction of alternative designs shall be at the expense of the Contractor.
  - c. If the Commissioner deems that the deficiency of a pile is due to unavoidable field conditions, the costs for replacement or additional piles will be paid at the contractual unit price for the appropriate steel pipe pile diameter. Pile driving and removal of partially installed piles deemed to be obstructed and abandoned by the Commissioner will also be paid at the contractual unit price for the appropriate steel pipe pile diameter.

#### 1.04 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Society for Testing and Materials (ASTM):
    - a. ASTM A27, Steel Castings, Carbon, for General Application.
    - b. ASTM A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - c. ASTM A252, Welded and Seamless Steel Pipe Piles.
    - d. ASTM D4945, Test Method for High-Strain Dynamic Testing of Piles.

2. American National Standards Institute/American Welding Society (ANSI/AWS):
  - a. ANSI/AWS D1.1, Structural Welding Code – Steel.
3. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

#### 1.05 SUBMITTALS

- A. Prepare and submit the following in accordance with the provisions of the General Conditions and Section 01330 - Shop Drawings:
  1. Qualifications Compliance: Submit references and project information to demonstrate the specialized experience of the proposed pile driving contractor, Contractor's Engineer, Contractor's Surveyor and the PDA testing firm on similar projects of comparable scope and complexity for a minimum of three years in accordance with the applicable paragraphs of Article 1.06.
  2. Shop Drawings
    - a. As-built survey showing locations of all existing piles, performed after demolition of the existing floor slab. Production piles shall not begin until after this survey is received by the Commissioner.
    - b. Pile Identification Plan: Prior to pile driving, submit a pile identification plan showing location of piles, pile cut-off elevations and a numbering system for the piles.
    - c. Drawings: Indicate details and schedules of pile installation to suit design requirements, pile driving shoes and splicing procedures.
  3. Quality Control Submittals
    - a. Work/Procedure Plans
      - (1) Descriptions of proposed methods, installation procedure, and equipment to be used for installing piles, including but not limited to, leads, driving frame and/or template and pile hammers, including associated appurtenances such as hammer cushions. Include manufacturer's literature for proposed equipment. Include

equipment and procedures for predrilling and proposed methods to remove obstructions if encountered.

- (2) Descriptions of proposed welding procedures and materials for all welded joints.
  - (3) Description of proposed method and equipment to be used in measuring placement tolerances of piles.
- b. Wave Equation Analysis results completed and signed by a licensed Professional Engineer registered in the State of New York with complete Hammer Equipment Data. Any changes to equipment shall be submitted in writing and subject to approval of the Commissioner. If the equipment is approved for change, the Contractor shall be required to submit a new Wave Equation Analysis with the appropriate equipment data revisions.
- c. Certificates
- (1) Manufacturer's mill certificates for steel piles, driving shoes and all welded attachments.
  - (2) Welders Certificates: Certify welders employed on the Work, verifying ANSI/AWS qualification within the previous 12 months.

#### 4. Record Documents

- a. Location plan with location and identification of each new pile installed with reference to existing piles previously installed within the site boundaries.
- b. Field Quality Control Records: Pile-driving records as specified and as may be otherwise requested by the Commissioner. Records shall include at a minimum pile driving records for each test and production pile including project name and number, name of contractor, pile location and number, computed pile capacity, type and size of hammer used, type of pile driving cap used, rate of operation of pile driving equipment, pile dimensions, elevation of point, elevation of butt before and after cut-off, elevations of splices, continuous record of number of blows for each foot of penetration and any unusual occurrences during pile driving. These records shall be compiled and attested to by a licensed Professional Engineer registered in the State of New York.
- c. PDA test reports and Case Pile Wave Analysis Program (CAPWAP) analysis for each drive test.

- d. Surveyed as-built locations of the piles, including out-of-place dimensions and direction measured at pile cut-off and out-of-plumb slope and direction for each pile.

## 1.06 QUALITY ASSURANCE

- A. Furnishing and installation of steel pipe piles shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto. Adhere to the provisions of the Specifications where the requirements are more stringent.

### B. Testing and Inspection

1. The installation of steel pipe piles, structural concrete and welding operations shall be subject to controlled inspection in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the provisions of the General Conditions. Controlled inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
2. Special Inspections
  - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
  - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
  - c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or

certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

- C. Provide the services of a general contractor or a specialty subcontractor that specializes in the installation of steel pipe piles and can demonstrate at least three (3) years of documented relevant experience in the installation of steel pipe piles under similar conditions to the work of this contract.
- D. Provide the services of a PDA testing firm with a minimum of three (3) years of documented experience in work of this nature. All PDA testing and reporting work shall be performed under the direct supervision of a licensed Professional Engineer (Contractor's Engineer) registered in the State of New York.
- E. Select pile components under the direct supervision of a licensed Professional Engineer (Contractor's Engineer) registered in the State of New York with documented experience in design of this work. Selection of pile driving equipment shall be under the direction of a licensed Professional Engineer registered in the State of New York with documented experience and proficiency in Geotechnical Engineering.
- F. Provide the services of an independent licensed surveyor to perform surveys and layouts and to determine vertical and horizontal alignments. Conform to the requirements of the General Conditions.
- G. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- H. Safety: Accept total responsibility for steel pipe pile installation procedures and health and safety of the work force. Comply fully with OSHA workplace safety requirements and regulations and those of other authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Except for piles to be used for test purposes, materials ordered or delivered to project site prior to completion and acceptance of all pile testing and verification of assumed pile length will be at the Contractor's risk.
- B. Handle piling using handling holes or lifting devices. Handle long length piles with care to prevent damage. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be in a vertical plane. Protect piling to prevent damage to coatings, where applicable, and to prevent corrosion prior to installation.
- C. After pile lengths are verified, deliver materials to project site in such quantities and at such times to assure continuity of pile driving operations to project schedule.

- D. Store piles in orderly groups above ground and blocked during storage to minimize possible distortion of members. Piles exhibiting variations beyond tolerance limits will be considered distorted and shall not be used in the work.

#### 1.08 PROJECT CONDITIONS

- A. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available as described in Section 01120 – Contract Summary. The Contractor may use this report to establish the quality of materials expected to be present at the project site and determine the proper length of piles. The Contractor is advised that all available samples and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of the Contract, but are available for information purposes only.
- B. The Contractor is responsible for any conclusions it may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. Neither the City of New York nor the Commissioner guarantees that materials other than those disclosed by the geotechnical report will not be encountered, or that proportions and character of the various materials will not vary from those indicated in the boring logs.
- C. Data on indicated subsurface conditions is not intended as a representation or warranty of continuity of such conditions. It is expressly understood that neither the City of New York nor the Commissioner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.
- D. If the Contractor finds that the investigations are not sufficient to determine the nature of the work, the Contractor can undertake its own investigations before or after submission of its bid at its own expense.
- E. Available Geotechnical Reports

Title	By	For
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

- F. Prior to bidding this project, the Contractor shall thoroughly explore the conditions at the site to be fully informed about the existing piles and construction debris left in the ground after demolition of the previous structure in the area where the piles will be driven. Bidders are invited to perform explorations of the site to acquaint themselves with these conditions at no additional cost to the City of New York. No additional compensation will be made after award of contract for any claim related to the pile remnants and construction debris left in the ground. The Contractor is

also encouraged to review the Geotechnical Investigation Report, which may be obtained from the City of New York-Contract Summary.

- G. Protect structures, underground utilities, and other construction as necessary from damage caused by pile driving operations.

## PART 2 PRODUCTS

### 2.01 STEEL PIPE PILES

- A. Pipe piles shall conform to ASTM A252 Grade 3 modified with minimum  $F_y = 50$  ksi. Diameter and wall thickness shall be as shown on the Contract Drawings.
- B. Pipe piles that do not exceed 18 inches in diameter may be either seamless pipe or full penetration electric resistance butt welded with straight or spiral seams. Pipe piles that exceed 18 inch in diameter shall be double submerged arc butt welded pipe with straight seams; spiral weld will not be accepted for these larger sizes. Pipe shall be welded in a manner that welding shall not crack or fail when the pile is subjected to its intended use, including during driving operations. The weld seam of each length of the pile shall be tested for acceptance by Ultrasonic Testing and Eddy Current Examination in accordance with the provisions for Nondestructive Electric Test of Weld Seam of ASTM A53.
- C. For pipe with filler metal welds having specified wall thickness of 0.500 inch and less, the radial offset (misalignment) of plate edges in the weld seams shall not be greater than 1/16 inch. For pipe with filler metal welds having specified wall thickness over 0.500 inch, the radial offset shall not be greater than 0.125 times the wall thickness or 1/8 inch, whichever is smaller. For electric welded pipe, the radial offset of plate edges plus flash trim shall be no more than 0.06 inch. For laser welded pipe, the radial offset of plate edges plus weld reinforcement trim shall be no greater than 0.06 inch.
- D. Pile driving shoes shall conform to ASTM A27 90/60 cast steel, heat treated. The Contractor shall propose and submit for approval driving shoe required to assure protection to the pile tip from damage. The Contractor shall be solely responsible for the sufficiency of such shoes.
- E. Welding electrodes for pile splices shall be E70XX minimum. Welding electrodes for driving shoe to pile welds shall be at low hydrogen E90XX.

### 2.02 CONCRETE

- A. Concrete shall be of class indicated on the Contract Drawings. Concrete mix and placement shall conform to the provisions of Section 03300 – Cast-in-Place Concrete.



### 2.03 REINFORCING STEEL

- A. Concrete reinforcement shall conform to Section 03200 – Concrete Reinforcement.

### 2.04 PILE COATING

- A. Concrete-filled steel pipe piles installed in on-shore applications to support land-based structures shall not be coated. An additional, sacrificial pipe wall thickness of 1/16" has been considered to account for section loss due to corrosion.

### 2.05 DRIVING EQUIPMENT

- A. Provide pile driving equipment of type generally used in standard driving practice, operated at manufacturer's specified rate, to develop required rated energy per blow. The minimum rated energy of the hammer shall be based upon the diameter of the pipe pile as follows:
  - 1. 15,000 ft-lbs for 16-inch diameter pipe pile
  - 2. 40,000 ft-lbs for 20-inch diameter pipe pile
  - 3. 80,000 ft-lbs for 36-inch diameter pipe pile
- B. Provide driving hammer of sufficient capacity, size and type to deliver consistently effective dynamic energy. The hammer energy shall be suitable to drive the piles to the ordered length or lengths necessary to obtain the required ultimate pile capacity without damage. The Contractor shall submit to the Commissioner the manufacturer's data regarding the hammer efficiency to be used for Wave Equation Analysis and throughout the job.
- C. Equip hammer with cast steel or structural steel driving cap, with grooved base conforming to pile shape. Keep bearing surfaces of grooves true and smooth.
- D. Use fixed or rigid type pile driver leads that will hold pile firmly in position and alignment, and in axial alignment of hammer. Unless otherwise approved by the Commissioner, leads shall be of sufficient length so that use of a follower will not be necessary.
- E. Provide a driving frame of sufficient size and rigidity to assist in keeping piles at planned location and plumbness.
- F. No variation of approved equipment will be allowed without written approval of the Engineer.

### 2.06 FABRICATION

- A. Shop fabricate and deliver to the site piles for the required installation length to minimize field welding. All shop-fabricated piles shall be spliced using fabrication

rolls and dog guides so that misalignment will not exceed 1" in any direction relative to a straight line connecting the ends of a pile.

B. Welding and Splicing

1. Splicing of piles will be permitted at no additional cost to the City of New York as required for installation. Splices shall develop the full strength of the pile section in compression, tension and bending.
2. Unless stricter requirements are shown on the Contract Drawing, splice sections of pipe with approved full penetration butt weld. Use an approved jig or alignment device during welding to maintain the required straightness of pipe specified herein. For splices made during pile installation, rigid frame pile leads may be used as a jig in a manner approved by the Commissioner.
3. Equip pile tips with driving shoes continuously welded to pipe.
4. All welding shall be performed by ANSI/AWS certified welders under the immediate supervision of a representative of the Commissioner. Cooperate with and assist the Commissioner in the performance of its duties.
5. All welding shall conform to the requirements of the ANSI/AWS D1.1. Submit details of groove preparation and welding procedures for approval prior to commencing welding operations. Acceptable welding processes are FCAW, GMAW, SMAW and SAW for shop welding and SMAW for field welding.
6. Shop splices of piles shall be located below the ground line. Field splices may be located above the ground line. Only one field splice is permitted per pile. Out-of-straightness for shop and field splices shall not exceed 0.25" per 10'-0" of pile length.
7. If welding procedure is interrupted once started, preheat temperatures shall be re-established prior to restarting of welding.

2.07 SOURCE QUALITY CONTROL

- A. All shop and field welds for structural steel will be visually inspected by an ANSI/AWS qualified welding inspector under the direction of the Commissioner. The on-site inspector will be an ANSI/AWS Certified Welding Inspector in accordance with the requirements specified in Section 6 of ANSI/AWS D1.1.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify site conditions.

- B. Submit for approval proposed installation procedures and equipment to be used.
- C. Use driving procedure, which will not cause damage to nearby structures.
- D. Protect structures near the Work from damage.

### 3.02 FIELD FABRICATION

- A. Conform to the requirements of Article 2.06.

### 3.03 TEST PILES

#### A. Drive-Test Piles

1. Drive test piles, identical to production piles, as shown on the Contract Drawings, and install with the same equipment and in the manner proposed for production piles.
2. Prior to driving test piles, the Contractor shall submit a wave equation analysis performed by a licensed Professional Engineer registered in the State of New York, using the proposed driving system. Based on this analysis, the Contractor shall determine order lengths and driving criteria for the test piles.
3. Install drive-test piles in the locations shown on the Contract Drawings unless otherwise directed by the Commissioner.
4. Driving of these piles shall be witnessed by the Special Inspector.
5. Static load tests for axial and lateral load capacity shall be performed on certain test piles at the locations shown on the Contract Drawings and in accordance with the requirements of Section 02456 – Pile Load Tests.
6. The results of the drive and load tests shall be submitted to the Commissioner at the completion of testing. Upon completion of all pile testing at the site, the Commissioner will use the results with other information to establish the required driving resistance criteria and, where applicable, minimum tip elevation criteria for the placing of production piles consistent with the placement procedures and equipment used. Pile order lengths shall be determined by the Contractor based on these criteria.
7. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.
8. Subsequent to the test program, test piles can be used as production piles if they meet all acceptance criteria thereof.

9. The Contractor shall accommodate the Special Inspector and shall not impede the progress or affect the results of the test. This may include but not be limited to providing a safe work area, allowing for the installation of gauges, inspection and performance of restrikes, and ceasing driving operations while testing adjacent piles if necessary.

**B. Dynamic Pile Tests**

1. Selected drive-load test piles shall be dynamically tested using electronic monitoring equipment to obtain information on pile hammer performance, driving stresses and bearing capacities. The locations of the Pile Dynamic Analysis (PDA) load tests are indicated on the Contract Drawings. The test will also be used to monitor driving of a production pile during a re-strike. If the Commissioner determines that a re-strike is required, it shall be performed after a waiting period of 48 hours (minimum) or up to 2 weeks (as determined by the Commissioner) after completion of the initial driving.
2. Perform Dynamic Testing only when the Special Inspector is present for witnessing. Notify the Commissioner of the schedule for testing at least 14 calendar days before starting the tests.
3. Drill the necessary holes in the pile and fasten a pair of transducers and a pair of accelerometers in place, then drive the pile while testing. Remove the transducers and accelerometers after the dynamic testing is completed.
4. Depending on the type of pile being driven, use a hammer and a capblock which will produce an acceptable driving stress within the piles. The equipment shall conform to the requirements of ASTM D4945. Use the same hammer and equipment as proposed to install the production piles.
5. Using the data obtained from the pile driving analyzer, the Contractor shall have a Case Pile Wave Analysis Program (CAPWAP) analysis performed and submitted to the Commissioner. The Contractor shall also have the hammer system efficiency and pile structural damage/integrity evaluated and reported to the Commissioner. Submit complete report to the Commissioner within five (5) business days of testing. Upon the completion of all Test Piles and the subsequent receipt of the aforementioned reports, the Commissioner will determine minimum pile tip elevations and driving resistance criteria for production piles based on the reports.
6. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.

**3.04 PILE INSTALLATION**

- A. The Contractor shall drive all piles using a positioning template.**

- B. In developing pile installation procedures and selecting equipment, the Contractor shall consider and be prepared to respond to local soil conditions, including the presence of a dense bearing stratum containing cobbles and boulders and construction debris as encountered in site explorations at the Southwest Brooklyn facility. It shall be the responsibility of the Contractor to select methods and equipment which will result in satisfactory installation of the piles.
- C. The installation and testing of all Test Piles shall be completed and analyzed prior to the installation of the production piles. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.
- D. All piles shall be driven to a tip elevation in conjunction with driving criteria determined from the wave equation analysis and the Pile Driving Analyzer (PDA) testing program.
- E. Piles shall be marked at 1-foot intervals along the entire pile length. In addition, the footage shall be marked and designated at 5-foot intervals starting from the tip of the pile.
- F. Deliver hammer blows to central axis of pile. Pile driving shall be continuous and without interruption for the final 20 feet of penetration. The average hammer blows per inch of penetration for the final 6 inches shall be as determined by the Commissioner. If an abrupt increase in driving resistance is encountered, the driving shall be terminated when the pile penetration is less than 0.5 inches in 10 successive blows. If the minimum tip elevation is not achieved prior to terminating driving due to excessive blow counts, the Contractor shall employ approved means and methods to advance the pile to the minimum tip elevation. Do not damage piles during driving operations.
- G. Jetting, pre-drilling or pre-augering is not permitted unless approved by the Commissioner.
- H. Re-drive piles which have lifted or moved due to driving adjacent piles, or by soil heave. A pile with heave greater than 1/4 inch as measured by the Commissioner will be considered a heaved pile and shall be re-driven.
- I. Inspect each pile within one (1) day after driving to check for leakage, intrusion of soil, and signs of damage. Report to the Commissioner immediately if these or other deleterious conditions are observed.
- J. Cut off each pile in accordance with the provisions of the Contract Drawings after approval by the Commissioner. Prevent foreign matter from entering the interior of the pipe pile prior to concreting.

## K. Placement Tolerances

1. Out-of-place and out-of-plumb measurements shall be made and reported to the Commissioner for each pile within (5) five days of driving.
2. Maximum out-of-place deviation, measured from centerline of pipe pile at the cut-off elevation shall be 3 inches in any direction.
3. In addition, maximum out-of-plumb deviation measured in any direction shall be 2%.
4. Maximum deviation from theoretical cut-off elevation: 1/2"

- L. Driving of piles shall not take place within 50 feet of concrete placed within 3 days unless otherwise approved by the Commissioner.

## 3.05 PILE OBSTRUCTIONS

- A. Boring logs for boreholes previously drilled at the project site indicate the presence of boulders and obstructions, such as pile remnants and construction debris. If such obstructions are encountered, and piles reach premature refusal during pile driving, the Contractor shall notify the Commissioner immediately.
- B. The Contractor shall probe to locate the extent of the obstruction and propose a method of passing or removing the obstruction, including the use of a chisel beam, spud, by drilling or by other suitable means.
- C. If the Contractor demonstrates, to the satisfaction of the Commissioner, after diligently attempting to remove or penetrate through an obstruction for a minimum period of four hours, that removal or penetration of the obstruction is deemed to be impractical using appropriate methods, tools and equipment, the Contractor will be requested to stop pile driving operations and await further instructions from the Commissioner. The costs incurred by the Contractor to attempt to remove or penetrate obstructions for the prescribed minimum duration, whether or not the efforts are successful, shall be included in the unit price bid for steel pipe piles and no separate payment will be made therefor.
- D. If the Commissioner declares the obstruction to be an unavoidable field condition, the Contractor will be directed to remove the partially installed pile and make changes in the design or alignment of the piling structure as required by the Commissioner to insure the adequacy and stability of the structure.
- E. Payment for installing and removing the obstructed pile and for installing replacement or additional piles will be made at the contractual unit price for the appropriate steel pipe pile diameter.

- F. Payment for additional labor and materials necessitated by changes in the design or alignment of the piling structure will be made at applicable contractual unit prices or by Change Order in accordance with the General Requirements.

### 3.06 CONCRETING

- A. Concrete Fill: Placement of concrete fill shall conform to Section 03300 – Cast-in-Place Concrete for the class of concrete indicated. Concrete shall not be placed within a pile until the pile and all other piles within a 20 foot radius have been checked for heave, redriven as necessary, and accepted by the Commissioner. The interior of the pile shall be cleaned to remove all solid matter from the inside wall before inserting reinforcing and placing concrete.
- B. Concrete Reinforcement: Furnish and install reinforcing steel in the pipe pile in accordance with the details indicated on the Contract Drawings and the materials and workmanship provisions of Section 03200 – Concrete Reinforcement.

### 3.07 UNACCEPTABLE PILES

- A. Unacceptable piles are defined as piles that fail penetration requirements, capacity requirements, are placed or cut off in positions beyond specified tolerances, or are damaged, including filling fully or partially with soil or groundwater.
- B. Replace unacceptable piles with piles that conform to specified requirements at no additional cost to the City of New York.
- C. Alternatively, in lieu of replacing unacceptable piles, additional piles may be placed in locations other than those shown on the Contract Drawings. This alternative may be used only with prior approval of the Commissioner for each individual location of use. All costs for design, analysis and construction of such alternative designs shall be at the expense of the Contractor.
- D. The Commissioner will determine if the deficiency of a pile is due to unavoidable field conditions, such as an immovable or impenetrable obstruction, or due to Contractor operations. See provisions of Paragraph 1.03.B for payment provisions.

### 3.08 FIELD QUALITY CONTROL

- A. All steel pipe pile inspections will be performed by the Special Inspector. The Contractor shall assist and provide access to the work area for field inspection by the Special Inspector. The Contractor shall cooperate with the Special Inspector in determining the minimum tip elevation required and shall mark each pile before driving as required.
- B. The driving of each pile shall be performed in the presence of the Special Inspector unless otherwise directed.

- C. When inspections result in pile rejection by the Special Inspector, the Contractor shall promptly segregate and remove rejected pile from the premises.
- D. Welding Inspections: Provisions of Article 2.07 shall apply.
- E. Inspection of Driven Piling: The Special Inspector will perform continuous inspection during pile driving and certify that piles are installed in accordance with requirements herein. Piles will be inspected for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Special Inspector.
- F. Installation Records: Driving records will be maintained by the Special Inspector and include the following as a minimum:
  - 1. Project name and number
  - 2. Name of Contractor and Installer
  - 3. Pile size and dimensions
  - 4. Elevation of point, elevation of butt before and after cut-off
  - 5. Continuous record of number of blows for each foot of penetration and final driving resistance in blows for final 6 inches
  - 6. Installation dates and times
  - 7. Driving equipment used including type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used
  - 8. Pile number and locations, tip elevations, ground elevations, cut-off elevations
  - 9. Length of driven pile from final tip elevation to cut-off elevation
  - 10. Any reheading or cutting of piles
  - 11. Alignment and plumbness checks
  - 12. Locations and depths where difficulty in driving was encountered
  - 13. Any unusual pile driving problems.
  - 14. Results of pile inspection after installation, checking for leakage, soil intrusion, and/or other signs of damage.

-END OF SECTION-



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**Section 02365**  
**COMPOSITE TAPERED PILES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. For the 150 ton pile only, the Contractor may elect to use an alternate type pile in lieu of the Basis of Design 20 inch diameter steel pipe pile. The alternate pile shall be a tapered pile such as Monotube, Tapertube, step-taper, or approved equivalent. This specification section shall be used for the Contractor's Option composite taper pile only. If the Contractor opts to bid on the Basis of Design 20 inch steel pipe pile, please refer to Section 02364 – Steel Pipe Piles; this specification section (02365 – Composite Tapered Piles) shall not apply.
- B. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, install, drive and cut off composite tapered piles and fill with concrete, complete in place in conformity with the lines, grades, dimensions and locations shown on the Contract Drawings, the procedures and tolerances specified herein, and as required for a complete installation. The work also includes Pile Driving Analyzer (PDA) setup and testing.
- C. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- D. This Section includes, but is not limited to, the following items:
  - 1. Composite tapered piles for building, in lieu of the Basis of Design 20 inch steel pipe piles.
  - 2. Pile Driving Analyzer (PDA) setup and testing including during restrikes as specified by the Commissioner.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02456 - Pile Load Tests
- B. Section 03200 - Concrete Reinforcement
- C. Section 03300 - Cast-in-Place Concrete

**1.03 MEASUREMENT AND PAYMENT**

- A. Measurement
  - 1. Composite Tapered Piles: The quantity of composite tapered piles to be measured for payment at the unit price bid will be the actual number of piles, including both production and test piles incorporated in the work, driven or

installed and left in place in conformity with the Contract Drawings and the Specifications or as directed by the Commissioner.

2. The approved quantity of composite tapered piles actually incorporated in the work, delineated by the specified unit of measurement, will be the basis for payment. The number of piles to be measured for payment shall include the length in place below the cutoff elevation measured to the pile tip.
3. Pile Driving Analyzer (PDA) Load Tests: The approved quantity of PDA pile load tests actually conducted on composite tapered piles which are completed, documented and accepted will be the basis for payment. PDA pile load tests conducted during initial drive and conducted during redrive/restrike will be measured as separate tests.
4. Units of measurement for the work specified in this Section shall be as follows:
  - a. Composite Tapered Piles – 20-inch diameter – per each
  - b. Pile Driving Analyzer Load Tests – per each.

#### B. Payment

##### 1. Composite Tapered Piles

- a. The unit price per composite tapered pile incorporated in the work shall include the cost of furnishing, fabrication, coating, delivery, storage and handling, installation, equipment, maintaining in proper condition, removal, re-installation, obstruction removal, shoes, shop and field splices, furnishing and placement of reinforcement, furnishing and placement of concrete, and other incidentals necessary to properly perform the work complete and in place as detailed on the Contract Drawings and accepted by the Commissioner. The unit price bid for this item shall apply to both production and test piles incorporated into the work.
- b. The basis for payment shall be the aggregate measured number of approved composite tapered piles, as defined in Paragraph 1.03.A.2, delineated by the specified unit of measurement, multiplied by the corresponding contractual unit price shown on the Bid Form.
- c. Composite tapered piles may be added or deleted as directed in writing by the Commissioner and paid for at the contractual unit price per each composite tapered pile.
- d. No separate payment will be made for inspection of composite tapered piles, pile tips, test or index piles, removing damaged or misdriven piles, piles driven for the temporary use or for the convenience of the Contractor, pre-drilling, removal of obstructions, jetting, spudding, pile

surveys and related drawings, pile cutoffs and their disposal off-site. The costs thereof shall be included in the unit price bid for composite tapered piles.

2. Pile Driving Analyzer Load Tests: The unit price bid per PDA load test shall include all materials, equipment, tools and labor incidental thereto, including the cost of engineering and analysis in preparation for the tests. The costs of furnishing and driving the drive-test piles will be paid under other unit price bid items as defined above.
3. Unacceptable Piles
  - a. Unacceptable composite tapered piles are addressed in Article 3.07.
  - b. If the Commissioner deems that the deficiency of a pile is due to Contractor operations, all costs for replacement piles or design, analysis and construction of alternative designs shall be at the expense of the Contractor.
  - c. If the Commissioner deems that the deficiency of a pile is due to unavoidable field conditions, the costs for replacement or additional piles will be paid at the contractual unit price. Pile driving and removal of partially installed piles deemed to be obstructed and abandoned by the Commissioner will also be paid at the contractual unit price.

#### 1.04 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  1. American Society for Testing and Materials (ASTM):
    - a. ASTM A27, Steel Castings, Carbon, for General Application.
    - b. ASTM A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - c. ASTM A252, Welded and Seamless Steel Pipe Piles.
    - d. ASTM D4945, Test Method for High-Strain Dynamic Testing of Piles.
  2. American National Standards Institute/American Welding Society (ANSI/AWS):
    - a. ANSI/AWS D1.1, Structural Welding Code – Steel.

## 3. City of New York

- a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
- b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

## 1.05 PERFORMANCE DESIGN CRITERIA

## A. The contractor's composite tapered pile design shall:

1. Consist of a tapered type, closed-end, displacement pile that achieves the required minimum axial and lateral capacity as indicated on the Contract Drawings.
2. Consider steel section loss due to corrosion as shown on the Contract Drawings. Pile coatings or other protection systems to reduce corrosion loss allowance shall not be allowed.
3. Provide a 20 inch diameter and minimum stiffness of  $EI=60,970,000 \text{ k-in}^2$  (roughly equal to that of the basis-of-design concrete-filled 20-inch diameter steel pipe pile specified in Section 02364) for the top 35 ft (measured from cutoff elevation).
4. Achieve the minimum lateral capacity and stiffness in each cross-sectional direction.

## 1.06 SUBMITTALS

## A. Prepare and submit the following in accordance with the provisions of the General Conditions and Section 01330 - Shop Drawings:

1. Qualifications Compliance: Submit references and project information to demonstrate the specialized experience of the proposed pile driving contractor, Contractor's Engineer, Contractor's Surveyor and the PDA testing firm on similar projects of comparable scope and complexity for a minimum of three (3) years in accordance with the applicable paragraphs of Article 1.06.
2. Composite Tapered Pile Design: For each pile type and design capacity submit the following for review:
  - a. Details of the design, including calculations and drawings. Submit calculations for at least two design sections: one based on conditions in Region A shown on the Contract Drawings, and the other based on conditions in Region B.

- b. Details of proposed concrete mix design including estimated setting time, strength properties, temperature-set time curve, and recommended installation procedures.
- c. Literature from the pile manufacturer showing the recommended installation procedures, yield and ultimate strength of the steel, and the minimum cross sectional area.
- d. Literature describing the proposed equipment to pump concrete into piles.
- e. The design shall be signed and sealed by a licensed Professional Engineer registered in the State of New York.

3. Shop Drawings:

- a. As-built survey showing locations of all existing piles, performed after demolition of the existing floor slab. Production piles shall not begin until after this survey is received by the Commissioner.
- b. Pile Identification Plan: Prior to pile driving, submit a pile identification plan showing location of piles, pile cut-off elevations and a numbering system for the piles.
- c. Drawings: Indicate details and schedules of pile installation to suit design requirements, pile driving shoes and splicing procedures.

4. Quality Control Submittals:

a. Work/Procedure Plans:

- (1) Descriptions of proposed methods, installation procedure, and equipment to be used for installing piles, including but not limited to, leads, driving frame and/or template and pile hammers, including associated appurtenances such as hammer cushions. Include manufacturer's literature for proposed equipment. Include equipment and procedures for predrilling and proposed methods to remove obstructions if encountered.
- (2) Descriptions of proposed welding procedures and materials for all welded joints.
- (3) Description of proposed method and equipment to be used in measuring placement tolerances of piles.

- b. Wave Equation Analysis results completed and signed by a licensed Professional Engineer registered in the State of New York with complete

Hammer Equipment Data. Any changes to equipment shall be submitted in writing and subject to approval of the Commissioner. If the equipment is approved for change, the Contractor shall be required to submit a new Wave Equation Analysis with the appropriate equipment data revisions.

c. Certificates

- (1) Manufacturer's mill certificates for steel piles, driving shoes and all welded attachments.
- (2) Welders Certificates: Certify welders employed on the Work, verifying ANSI/AWS qualification within the previous 12 months.

5. Record Documents:

- a. Location plan with location and identification of each new pile installed with reference to existing piles previously installed within the site boundaries.
- b. Field Quality Control Records: Pile-driving records as specified and as may be otherwise requested by the Commissioner. Records shall include at a minimum pile driving records for each test and production pile including project name and number, name of contractor, pile location and number, computed pile capacity, type and size of hammer used, type of pile driving cap used, rate of operation of pile driving equipment, pile dimensions, elevation of point, elevation of butt before and after cut-off, elevations of splices, continuous record of number of blows for each foot of penetration and any unusual occurrences during pile driving. These records shall be compiled and attested to by a licensed Professional Engineer registered in the State of New York.
- c. PDA test reports and Case Pile Wave Analysis Program (CAPWAP) analysis for each drive test.
- d. Surveyed as-built locations of the piles, including out-of-place dimensions and direction measured at pile cut-off and out-of-plumb slope and direction for each pile.

1.07 QUALITY ASSURANCE

- A. Furnishing and installation of composite tapered piles shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto. Adhere to the provisions of the Specifications where the requirements are more stringent.

**B. Testing and Inspection**

1. The installation of composite tapered piles, structural concrete and welding operations shall be subject to special inspection in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the provisions of the General Conditions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
2. Special Inspections
  - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
  - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
  - c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- C. Provide the services of a general contractor or a specialty subcontractor that specializes in the installation of composite tapered piles and can demonstrate at least three years of documented relevant experience in the installation of composite tapered piles under similar conditions to the work of this contract.
- D. Provide the services of a PDA testing firm with a minimum of three years of documented experience in work of this nature. All PDA testing and reporting work



shall be performed under the direct supervision of a licensed Professional Engineer (Contractor's Engineer) registered in the State of New York.

- E. Select pile components under the direct supervision of a licensed Professional Engineer (Contractor's Engineer) registered in the State of New York with documented experience in design of this work. Selection of pile driving equipment shall be under the direction of a licensed Professional Engineer registered in the State of New York with documented experience and proficiency in Geotechnical Engineering.
- F. Provide the services of an independent licensed surveyor to perform surveys and layouts and to determine vertical and horizontal alignments. Conform to the requirements of the General Conditions.
- G. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- H. Safety: Accept total responsibility for composite tapered pile installation procedures and health and safety of the work force. Comply fully with OSHA workplace safety requirements and regulations and those of other authorities having jurisdiction.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Handle piling using handling holes or lifting devices. Handle long length piles with care to prevent damage. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be in a vertical plane. Protect piling to prevent damage to coatings, where applicable, and to prevent corrosion prior to installation.
- B. After pile lengths are verified, deliver materials to project site in such quantities and at such times to assure continuity of pile driving operations to project schedule.
- C. Store piles in orderly groups above ground and blocked during storage to minimize possible distortion of members. Piles exhibiting variations beyond tolerance limits will be considered distorted and shall not be used in the work.

#### 1.09 PROJECT CONDITIONS

- A. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available as described in Section 01120 – Contract Summary. The Contractor may use this report to establish the quality of materials expected to be present at the project site and determine the proper length of piles. The Contractor is advised that all available samples and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of the Contract, but are available for information purposes only.

- B. The Contractor is responsible for any conclusions it may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. Neither the City of New York nor the Commissioner guarantees that materials other than those disclosed by the geotechnical report will not be encountered, or that proportions and character of the various materials will not vary from those indicated in the boring logs.
- C. Data on indicated subsurface conditions is not intended as a representation or warranty of continuity of such conditions. It is expressly understood that neither the City of New York nor the Commissioner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.
- D. If the Contractor finds that the investigations are not sufficient to determine the nature of the work, the Contractor can undertake its own investigations before or after submission of its bid at its own expense.

E. Available Geotechnical Reports

Title	By	For
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

- F. Prior to bidding this project, the Contractor shall thoroughly explore the conditions at the site to be fully informed about the existing piles and construction debris left in the ground after demolition of the previous structure in the area where the piles will be driven. Bidders are invited to perform explorations of the site to acquaint themselves with these conditions at no additional cost to the City of New York. No additional compensation will be made after award of contract for any claim related to the pile remnants and construction debris left in the ground. The Contractor is also encouraged to review the Geotechnical Investigation Report, which may be obtained from the City of New York.
- G. Protect structures, underground utilities, and other construction as necessary from damage caused by pile driving operations.

## PART 2 PRODUCTS

### 2.01 COMPOSITE TAPERED PILES

- A. Composite tapered piles shall have minimum  $F_y = 50$  ksi.
- B. Pipe pile portions of composite tapered piles that exceed 18 inch in diameter shall be double submerged arc butt welded pipe with straight seams; spiral weld will not be accepted for these larger sizes. Pipe shall be welded in a manner that welding

shall not crack or fail when the pile is subjected to its intended use, including during driving operations. The weld seam of each length of the pile shall be tested for acceptance by Ultrasonic Testing and Eddy Current Examination in accordance with the provisions for Nondestructive Electric Test of Weld Seam of ASTM A53.

- C. For pipe with filler metal welds having specified wall thickness of 0.500 inch and less, the radial offset (misalignment) of plate edges in the weld seams shall not be greater than 1/16 inch. For pipe with filler metal welds having specified wall thickness over 0.500 inch, the radial offset shall not be greater than 0.125 times the wall thickness or 1/8 inch, whichever is smaller. For electric welded pipe, the radial offset of plate edges plus flash trim shall be no more than 0.06 inch. For laser welded pipe, the radial offset of plate edges plus weld reinforcement trim shall be no greater than 0.06 inch.
- D. Pile driving shoes, if used, shall conform to ASTM A27 90/60 cast steel, heat treated. The Contractor shall propose and submit for approval driving shoe required to assure protection to the pile tip from damage. The Contractor shall be solely responsible for the sufficiency of such shoes.
- E. Welding electrodes for pile splices shall be E70XX minimum. Welding electrodes for driving shoe to pile welds shall be at low hydrogen E90XX.

## 2.02 CONCRETE

- A. Concrete shall be of class indicated on the Contract Drawings. Concrete mix and placement shall conform to the provisions of Section 03300 – Cast-in-Place Concrete.

## 2.03 REINFORCING STEEL

- A. Concrete reinforcement shall conform to Section 03200 – Concrete Reinforcement.

## 2.04 PILE COATING

- A. Concrete-filled composite tapered piles installed in on-shore applications to support land-based structures shall not be coated. Design of composite tapered piles shall consider steel shell section loss due to corrosion.

## 2.05 DRIVING EQUIPMENT

- A. Provide pile driving equipment of type generally used in standard driving practice, operated at manufacturer's specified rate, to develop required rated energy per blow.
- B. Provide driving hammer of sufficient capacity, size and type to deliver consistently effective dynamic energy. The hammer energy shall be suitable to drive the piles to the ordered length or lengths necessary to obtain the required ultimate pile capacity

without damage. The Contractor shall submit to the Commissioner the manufacturer's data regarding the hammer efficiency to be used for Wave Equation Analysis and throughout the job.

- C. Use fixed or rigid type pile driver leads that will hold pile firmly in position and alignment, and in axial alignment of hammer. Unless otherwise approved by the Commissioner, leads shall be of sufficient length so that use of a follower will not be necessary.
- D. Provide a driving frame of sufficient size and rigidity to assist in keeping piles at planned location and plumbness.
- E. No variation of approved equipment will be allowed without written approval of the Commissioner.

## 2.06 FABRICATION

- A. Shop fabricate and deliver to the site piles for the required installation length to minimize field welding. All shop-fabricated piles shall be spliced using fabrication rolls and dog guides so that misalignment will not exceed 1" in any direction relative to a straight line connecting the ends of a pile.
- B. Welding and Splicing
  - 1. Splicing of piles will be permitted at no additional cost to the City of New York as required for installation. Splices shall develop the full strength of the pile section in compression, tension and bending.
  - 2. Unless stricter requirements are shown on the Contract Drawing, splice sections of pipe with approved full penetration butt weld. Use an approved jig or alignment device during welding to maintain the required straightness of pipe specified herein. For splices made during pile installation, rigid frame pile leads may be used as a jig in a manner approved by the Commissioner.
  - 3. Equip pile tips with driving shoes continuously welded to pipe.
  - 4. All welding shall be performed by ANSI/AWS certified welders under the immediate supervision of a representative of the Commissioner. Cooperate with and assist the Commissioner in the performance of its duties.
  - 5. All welding shall conform to the requirements of the ANSI/AWS D1.1. Submit details of groove preparation and welding procedures for approval prior to commencing welding operations. Acceptable welding processes are FCAW, GMAW, SMAW and SAW for shop welding and SMAW for field welding.

6. Shop splices of piles shall be located below the ground line. Field splices may be located above the ground line. Only one field splice is permitted per pile. Out-of-straightness for shop and field splices shall not exceed 0.25" per 10'-0" of pile length.
7. If welding procedure is interrupted once started, preheat temperatures shall be re-established prior to restarting of welding.

## 2.07 SOURCE QUALITY CONTROL

- A. All shop and field welds for structural steel will be visually inspected by an ANSI/AWS qualified welding inspector under the direction of the Commissioner. The on-site inspector will be an ANSI/AWS Certified Welding Inspector in accordance with the requirements specified in Section 6 of ANSI/AWS D1.1.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Verify site conditions.
- B. Submit for approval proposed design, installation procedures and equipment to be used.
- C. Use driving procedure, which will not cause damage to nearby structures.
- D. Protect structures near the Work from damage.

### 3.02 FIELD FABRICATION

- A. Conform to the requirements of Article 2.06.

### 3.03 TEST PILES

- A. Drive-Test Piles
  1. Drive test piles, identical to production piles, as shown on the Contract Drawings, and install with the same equipment and in the manner proposed for production piles.
  2. Prior to driving test piles, the Contractor shall submit a wave equation analysis performed by a licensed Professional Engineer registered in the State of New York, using the proposed driving system. Based on this analysis, the Contractor shall determine order lengths and driving criteria for the test piles.
  3. Install drive-test piles in the locations shown on the Contract Drawings unless otherwise directed by the Commissioner.

4. Driving of these piles shall be witnessed by the Special Inspector.
5. Static load tests for axial and lateral load capacity shall be performed on certain test piles at the locations shown on the Contract Drawings and in accordance with the requirements of Section 02456 – Pile Load Tests.
6. The results of the drive and load tests shall be submitted to the Commissioner at the completion of testing. Upon completion of all pile testing at the site, the Contractor shall submit for the Commissioner's approval the required driving resistance criteria and, where applicable, minimum tip elevation criteria for the placing of production piles consistent with the placement procedures and equipment used. Pile order lengths shall be determined by the Contractor based on these criteria.
7. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.
8. Subsequent to the test program, test piles can be used as production piles if they meet all acceptance criteria thereof.
9. The Contractor shall accommodate the Special Inspector and shall not impede the progress or affect the results of the test. This may include but not be limited to providing a safe work area, allowing for the installation of gauges, inspection and performance of restrikes, and ceasing driving operations while testing adjacent piles if necessary.

**B. Dynamic Pile Tests**

1. Selected drive-load test piles shall be dynamically tested using electronic monitoring equipment to obtain information on pile hammer performance, driving stresses and bearing capacities. The locations of the Pile Dynamic Analysis (PDA) load tests are indicated on the Contract Drawings. The test will also be used to monitor driving of a production pile during a re-strike. The need for re-strike and the waiting period required shall be determined by the Contractor based on his design.
2. Perform Dynamic Testing only when the Special Inspector is present for witnessing. Notify the Commissioner of the schedule for testing at least 14 calendar days before starting the tests.
3. Drill the necessary holes in the pile and fasten a pair of transducers and a pair of accelerometers in place, then drive the pile while testing. Remove the transducers and accelerometers after the dynamic testing is completed.
4. Depending on the type of pile being driven, use a hammer and a capblock which will produce an acceptable driving stress within the piles. The

equipment shall conform to the requirements of ASTM D4945. Use the same hammer and equipment as proposed to install the production piles.

5. Using the data obtained from the pile driving analyzer, the Contractor shall have a Case Pile Wave Analysis Program (CAPWAP) analysis performed and submitted to the Commissioner. The Contractor shall also have the hammer system efficiency and pile structural damage/integrity evaluated and reported to the Commissioner. Submit complete report, including Contractor's proposed driving resistance criteria, to the Commissioner within five (5) business days of testing. Upon the completion of all Test Piles and the subsequent receipt of the aforementioned reports, the Commissioner will approve driving resistance criteria for production piles based on the report.
6. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.

### 3.04 PILE INSTALLATION

- A. The Contractor shall drive all piles using a positioning template.
- B. In developing pile installation procedures and selecting equipment, the Contractor shall consider and be prepared to respond to local soil conditions, including the presence of a dense bearing stratum containing cobbles and boulders and construction debris as encountered in site explorations at the Southwest Brooklyn facility, and the presence of existing piles. It shall be the responsibility of the Contractor to select methods and equipment which will result in satisfactory installation of the piles.
- C. The installation and testing of all Test Piles shall be completed and analyzed prior to the installation of the production piles. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.
- D. All piles shall be driven to a tip elevation in conjunction with driving criteria determined from the wave equation analysis and the Pile Driving Analyzer (PDA) testing program.
- E. Piles shall be marked at 1-foot intervals along the entire pile length. In addition, the footage shall be marked and designated at 5-foot intervals starting from the tip of the pile.
- F. Deliver hammer blows to central axis of pile. Pile driving shall be continuous and without interruption for the final 20 feet of penetration. The average hammer blows per inch of penetration for the final 6 inches shall be as determined by the Commissioner. If an abrupt increase in driving resistance is encountered, the driving shall be terminated when the pile penetration is less than 0.5 inches in 10 successive blows. If the minimum tip elevation is not achieved prior to terminating

driving due to excessive blow counts, the Contractor shall employ approved means and methods to advance the pile to the minimum tip elevation. Do not damage piles during driving operations.

- G. Jetting, pre-drilling or pre-augering is not permitted unless approved by the Commissioner.
- H. Re-drive piles which have lifted or moved due to driving adjacent piles, or by soil heave. A pile with heave greater than 1/4 inch as measured by the Commissioner will be considered a heaved pile and shall be re-driven.
- I. Inspect each pile within one (1) day after driving to check for leakage, intrusion of soil, and signs of damage. Report to the Commissioner immediately if these or other deleterious conditions are observed.
- J. Cut off each pile in accordance with the provisions of the Contract Drawings after approval by the Commissioner. Prevent foreign matter from entering the interior of the pile prior to concreting.
- K. Placement Tolerances
  - 1. Out-of-place and out-of-plumb measurements shall be made and reported to the Commissioner for each pile within (5) five days of driving.
  - 2. Maximum out-of-place deviation, measured from centerline of each composite tapered pile at the cut-off elevation shall be 3 inches in any direction.
  - 3. In addition, maximum out-of-plumb deviation measured in any direction shall be 2%.
  - 4. Maximum deviation from theoretical cut-off elevation: 1/2".
- L. Driving of piles shall not take place within 50 feet of concrete placed within 3 days unless otherwise approved by the Commissioner.

### 3.05 PILE OBSTRUCTIONS

- A. Boring logs for boreholes previously drilled at the project site indicate the presence of boulders and obstructions, such as pile remnants and construction debris. If such obstructions are encountered, and piles reach premature refusal during pile driving, the Contractor shall notify the Commissioner immediately.
- B. The Contractor shall probe to locate the extent of the obstruction and propose a method of passing or removing the obstruction, including the use of a chisel beam, spud, by drilling or by other suitable means.



- C. If the Contractor demonstrates, to the satisfaction of the Commissioner, after diligently attempting to remove or penetrate through an obstruction for a minimum period of four hours, that removal or penetration of the obstruction is deemed to be impractical using appropriate methods, tools and equipment, the Contractor will be requested to stop pile driving operations and await further instructions from the Commissioner. The costs incurred by the Contractor to attempt to remove or penetrate obstructions for the prescribed minimum duration, whether or not the efforts are successful, shall be included in the unit price bid for composite tapered piles and no separate payment will be made therefor.
- D. If the Commissioner declares the obstruction to be an unavoidable field condition, the Contractor will be directed to remove the partially installed pile and make changes in the design or alignment of the piling structure as required by the Commissioner to insure the adequacy and stability of the structure.
- E. Payment for installing and removing the obstructed pile and for installing replacement or additional piles will be made at the contractual unit price for the composite tapered pile.
- F. Payment for additional labor and materials necessitated by changes in the design or alignment of the piling structure will be made at applicable contractual unit prices or by Change Order in accordance with the General Requirements.

### 3.06 CONCRETING

- A. Concrete Fill: Placement of concrete fill shall conform to Section 03300 – Cast-in-Place Concrete for the class of concrete indicated. Concrete shall not be placed within a pile until the pile and all other piles within a 20 foot radius have been checked for heave, redriven as necessary, and accepted by the Commissioner. The interior of the pile shall be cleaned to remove all solid matter from the inside wall before inserting reinforcing and placing concrete.
- B. Concrete Reinforcement: Furnish and install reinforcing steel in the composite tapered pile in accordance with the details indicated on the Contract Drawings and the materials and workmanship provisions of Section 03200 – Concrete Reinforcement.

### 3.07 UNACCEPTABLE PILES

- A. Unacceptable piles are defined as piles that fail penetration requirements, capacity requirements, are placed or cut off in positions beyond specified tolerances, or are damaged, including filling fully or partially with soil or groundwater.
- B. Replace unacceptable piles with piles that conform to specified requirements at no additional cost to the City of New York.

- C. Alternatively, in lieu of replacing unacceptable piles, additional piles may be placed in locations other than those shown on the Contract Drawings. This alternative may be used only with prior approval of the Commissioner for each individual location of use. All costs for design, analysis and construction of such alternative designs shall be at the expense of the Contractor.
- D. The Commissioner will determine if the deficiency of a pile is due to unavoidable field conditions, such as an immovable or impenetrable obstruction, or due to Contractor operations. See provisions of Paragraph 1.03.B for payment provisions.

### 3.08 FIELD QUALITY CONTROL

- A. All composite tapered pile inspections will be performed by the Special Inspector. The Contractor shall assist and provide access to the work area for field inspection by the Special Inspector. The Contractor shall cooperate with the Special Inspector in determining the minimum tip elevation required and shall mark each pile before driving as required.
- B. The driving of each pile shall be performed in the presence of the Special Inspector unless otherwise directed.
- C. When inspections result in pile rejection by the Special Inspector, the Contractor shall promptly segregate and remove rejected pile from the premises.
- D. Welding Inspections: Provisions of Article 2.07 shall apply.
- E. Inspection of Driven Piling: The Special Inspector will perform continuous inspection during pile driving and certify that piles are installed in accordance with requirements herein. Piles will be inspected for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Special Inspector.
- F. Installation Records: Driving records will be maintained by the Special Inspector and include the following as a minimum:
  - 1. Project name and number
  - 2. Name of Contractor and Installer
  - 3. Pile size and dimensions
  - 4. Elevation of point, elevation of butt before and after cut-off
  - 5. Continuous record of number of blows for each foot of penetration and final driving resistance in blows for final 6 inches
  - 6. Installation dates and times

7. Driving equipment used including type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used
8. Pile number and locations, tip elevations, ground elevations, cut-off elevations
9. Length of driven pile from final tip elevation to cut-off elevation
10. Any reheading or cutting of piles
11. Alignment and plumbness checks
12. Locations and depths where difficulty in driving was encountered
13. Any unusual pile driving problems.
14. Results of pile inspection after installation, checking for leakage, soil intrusion, and/or other signs of damage.

-END OF SECTION-

**Section 02371**  
**DUST, SOIL EROSION AND SEDIMENTATION CONTROL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to assure adequate environmental protection including implementation of all erosion and sediment control measures and maintenance of storage areas as directed by the Resident Engineer.
- B. The Contractor shall provide a Sedimentation, Storm Water and Soil Erosion Control Plan in compliance with the NYS DEC approved Storm Water Pollution Prevention Plan (SWPPP) that addresses measures to prevent migration of contaminated storm water and sediment and to prevent erosion of features of the Work.
- C. The Contractor shall prevent discharge of sediment or erosion to watercourses, public streets or private property from dewatering operations. The Contractor shall provide methods to prevent demolition and construction debris from contaminating storm water runoff.
- D. The Contractor shall comply with all applicable regulatory requirements and all Federal, State, or local laws, codes, ordinances and regulations that govern the control of sediment, erosion and storm water during excavation.
- E. The Contractor shall provide silt fences, catch basins sediment traps, stabilized construction entrances or other approved means as a temporary structural practice to minimize erosion and sediment runoff.
- F. The Contractor shall provide and implement storm water pollution prevention in accordance with the Federal National Pollution Discharge Elimination System (NPDES) and State Pollution Discharge Elimination System (SPDES).
- G. The Contractor shall control dust and noise caused by operation and movement of vehicles and equipment in accordance with the latest NYC DEP, and OSHA standards, and all other applicable Federal, State and local regulations.
- H. The Contractor shall comply with the requirements given in the NYS DEC approved Stormwater Pollution Prevention Plan (SWPPP) for the project. Any changes intended to be made to the SWPPP recommendations should be submitted in conformance with Article 1.06.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02240 - Dewatering

## 1.03 REFERENCES

A. Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. ASTM D 3786 - Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
2. ASTM D 4354 - Sampling of Geosynthetics for Testing
3. ASTM D 4355 - Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
4. ASTM D 4439 - Standard Terminology for Geotextiles
5. ASTM D 4491 - Water Permeability of Geotextiles by Permittivity
6. ASTM D 4533 - Trapezoid Tearing Strength of Geotextiles
7. ASTM D 4632 - Test Method for Grab Breaking Load and -Elongation of Geotextiles
8. ASTM D 4751 - Method for Determining Apparent Opening Size of a Geotextile
9. ASTM D 4759 - Method for Determining the Specification Conformance of Geosynthetics
10. ASTM D 4873 - Method for Identification, Storage, and Handling of Geotextiles
11. ASTM D 1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method
12. ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Hammer and 18-in. Drop
13. ASTM D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
14. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings

15. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section 650 (Subpart p - Excavations)
16. State of New York DEC General Discharge Permit
17. New York State Stormwater Management Design Manual
18. New York Standards and Specifications for Erosion and Sediment Controls
19. SWPPP approved by the NYS DEC

#### 1.04 DEFINITIONS

- A. Primary System: Consists of one or more of the following components: silt fence, sediment traps, stabilized construction entrances, sumps, pumps, piping, or other means determined by the Contract Documents. Components shall be of sufficient size to handle the temporary sediment, storm water and erosion control as required by the Contract Documents.
- B. Backup Components: Components such as backup pumps, piping and other components which shall be sufficiently sized and prepared to incorporate them into the system if there is potential for the failure of a primary system component. (i.e., if generators are part of the primary system, have generators readily available in the event of a power failure).

#### 1.05 SYSTEM DESCRIPTION

- A. Silt Fences: The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (i.e. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations required and shown on the approved working drawings. Final removal of silt fence barriers shall be upon approval by the Resident Engineer.
- B. Sediment Traps: Sediment trap basins shall be provided around the catch basins to intercept sediment laden runoff and retain the sediment. Proposed locations of sediment traps are shown in the SWPPP. In addition, the Contractor shall provide sediment traps around any other temporary stormwater outlets from the construction site. Upon approval by the Resident Engineer, the sediment trap shall be removed and the area stabilized when the constructed drainage area has been properly stabilized.
- C. Stabilized Construction Entrances: The Contractor shall provide a stabilized pad of aggregates underlain with geotextile at all construction vehicle ingress and egress locations to eliminate tracking of sediments onto public rights of way. Representative locations of the stabilized constructions are shown in the SWPPP.

## 1.06 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Working Drawings: The Contractor shall submit to the Resident Engineer for approval Working Drawings and other documentation required to show conformance with the requirements specified and shown on the Contract Drawings.
  - 1. Working drawings shall show details of the Sediment and Storm Water Control System. The working drawings shall include, at a minimum, the following:
    - a. Plan locations of all components of the Sediment/Storm water Control System.
    - b. Detail of silt fence, sediment traps, stabilized construction entrances, and other installations.
  - 2. The Contractor shall submit manufacturer's descriptive literature and installation instructions for stockpile liner and cover material.
- C. Sedimentation and Storm Water Control Plan (SSCP): The Contractor shall develop and submit for approval, 30 days following Notice to Proceed, an SSCP, in accordance with the SWPPP. The SSCP shall address schedules and measures that will be taken to prevent migration of contaminated storm water/sediment, and to prevent erosion of features of the Work. The SSCP shall include the following at a minimum:
  - 1. Storm water runoff, noise, odor control and air pollution prevention.
  - 2. Provisions for silt fences, sediment traps, stabilized construction entrances and other measures to limit migration of sediments
  - 3. Diversion of storm water: The Contractor shall include provisions for controlling storm water runoff in and around excavation areas.
  - 4. Soil Storage Area: All details of temporary soil storage to be implemented as specified in this section.
  - 5. Soil Stabilization practices: All details of soil stabilization practices to be implemented, as specified in this section.
- D. Inspection Reports: Contractor shall submit SSCP inspection reports at the beginning of each month.

## 1.07 PERMITS AND REGULATIONS

- A. The Contractor shall obtain all necessary permits and be responsible for implementing the terms and requirements of these permits as needed and for payment of all fees.
- B. Handle all material in compliance with applicable requirements of OSHA and other governing authorities having jurisdiction.
- C. Codes and Standards: State and City laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

## 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Soil Stabilization: The stabilization practices to be implemented shall include one or a combination of the following: temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation. Stabilization practices shall be as approved by the Engineer. The Contractor shall record the dates when the major grading activities occur (i.e., clearing and grubbing, excavation, embankment and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in Paragraphs 1.08A.1 and 1.08A.2, stabilization practices shall be initiated as soon as practicable, but no more than 14 days after construction activities have temporarily or permanently ceased.
  - 1. Unsuitable Conditions: Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.
  - 2. Temporary Inactivity Less than 21 Days: Where construction activity will resume on a portion of the site within 21 days after it temporarily ceases, no stabilization practices will be required.
- B. Sediment and Storm Water Control: Sediment and storm water control components shall be operational at all times during the Work, specifically during excavation, backfilling and restoration, and decontamination operations. The sediment and storm water control system shall be capable of handling Storm water during construction. Damage to excavation slopes and the migration of contaminated soil to downstream areas resulting from storm events shall be repaired or remediated by the Contractor, at the Contractor's expense.
- C. Storm water: At no time shall the Contractor allow storm water from soil stockpiling operations, or water from decontamination operations to migrate off of,



or percolate into, the ground below the temporary stockpile area or decontamination area, so as to impact non-contaminated areas. The Resident Engineer will monitor any overflow or leakage that occurs, and may, at his discretion, require the Contractor to perform soil sampling within non-contaminated areas affected by such overflow. Any soils that have been contaminated by such overflow shall be removed, treated and disposed of by the Contractor. All sampling, analyses, treatment and disposal of soils required as a result of overflow on formerly non-contaminated soil shall be performed by the Contractor at no additional cost to the City.

- D. Disposal of Water: Water collected from decontamination areas, dewatering operations and soil stockpiles shall be handled in accordance with Section 02240 - Dewatering.

#### 1.09 PROJECT CONDITIONS

- A. Existing Work: All silt fences, sediment traps, construction entrances, sumps, pumps, piping, and other sediment/storm water controls shall be installed such that other aspects of the Work are not adversely impacted or endangered. The sediment traps should be installed avoiding any interference with the construction traffic. All installations shall be subject to the approval of the Resident Engineer.
- B. Dust Control: The Contractor shall be responsible for controlling visible dust caused by Work operations and the moving of vehicles and equipment. Dust control shall be implemented when soils are exposed, before, during and after Work activity ceases. Dust control will also be required on the weekends. The Contractor shall apply water or use other methods, subject to the Resident Engineer's approval, when visible dust is present on-site, in accordance with the Health and Safety Plan. The use of chemicals, including calcium chloride for dust control, will not be permitted.
  - 1. All excavation, loading and transport of materials shall minimize the formation of dust. To prevent dust generation, application of water to roadways and active work areas shall be utilized as required. The Contractor's operations shall include air monitoring and dust minimization measures, consistent with the Health and Safety Plan (HASP) required by Section 01356 - Safe and Healthful Working Conditions.
- C. Silt and Sediment Disposal: All silt and sediment which accumulates behind silt fences or other erosion control structures shall be removed and disposed of off-site in accordance with all applicable Federal, State and local regulations.

#### 1.10 STORAGE, HANDLING AND REMOVAL

- A. Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

**PART 2 PRODUCTS****2.01 MATERIALS****A. Components for Silt Fences**

1. **Filter Fabric:** Geotextile fabric that consists of a woven pervious sheet of plastic yarn as defined by ASTM D 123-90 and ASTM D 4439. The geotextile fabric shall be one that is recommended for such use by the manufacturer. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide and shall contain stabilizers and inhibitors added to the base plastic, if necessary, to make the filament resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextile fabric shall be finished to prevent the outer fiber from pulling away.
2. **Seams:** The seams of the geotextile fabric shall be sewn with thread of material compatible with the fabric given above for geotextile yarn. Factory seams shall be tested in accordance with Method ASTM D1683-90, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength of the geotextile fabric in any direction.

<b>Filter Fabric Physical Requirements</b>		
<b>Physical Property</b>	<b>Test Procedure</b>	<b>Acceptable Values</b>
Weight	ASTM D3776	5.6 oz/sy
Thickness	ASTM D1777	24 mils
Grab Tensile Strength Elongation (%)	ASTM D 4632	10 lbs./ %
Burst Strength	ASTM D3786	500+ psi
Trapezoid Tear Strength	ASTM D4533	115 x 90 lb.

3. **Silt Fence Stakes and Posts:** Provide wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum mass of 1.33 pounds per linear foot and a minimum length of 5 feet.

**B. Components for Stabilized Construction Entrances**

1. **Aggregates:** The aggregates to be used shall be a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

2. The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

<b>Fabric Properties</b>	<b>Test Procedure</b>	<b>Acceptable Values</b>
Grab Tensile Strength (lbs)	ASTM D1682	220
Elongation at Failure(%)	ASTM D1682	60
Mullen Burst (lbs)	ASTM D3786	430
Puncture Strength (lbs)	ASTM D751 modified	125
Equivalent Opening Size	Us Std Sieve CW-02215	40-80
Aggregate Depth	-	10

- C. Mill Certificate: A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate signed by an authorized official from the company manufacturing the filter fabric.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Silt Fences: Silt fences shall extend a minimum of 16 inches to a maximum of 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6-inch overlap, and securely sealed. A trench shall be excavated, approximately 4 inches wide and 4 inches deep, on the up slope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences may only be removed upon approval by the Engineer.
- B. Sediment Traps: The volume of sediment storage of the traps shall be 3600 cubic feet per acre of contributory drainage. All excavations for the trap shall be carried in such a way that the erosion and water pollution shall be minimal. All cut slopes of the basin shall be 1:1 or flatter.
- C. Stabilized Construction Entrances; Stabilized Construction Entrances shall have a minimum thickness of six inches. The width shall be at least 12 foot but not less than the full width of points where ingress or egress occurs. However, the width shall be a minimum of 24-foot if there is only one access to the site. Stabilized Construction Entrances shall be at least 50 feet long. Geotextile shall be placed over the entire area to be covered with aggregate. Piping of surface water under

entrance shall be provided if required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

D. Maintenance: The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

1. Silt Fence Maintenance: Silt fences shall be inspected in accordance with Article 3.02 of this Section. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed and disposed of off-site when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence shall be shaped to an acceptable grade and stabilized.
2. Sediment Trap maintenance: Sediment traps shall be inspected after each rain and repairs made as needed. Sediments from sediment traps shall be removed and the trap restored to its original dimensions when the sediment has accumulated to half the design depth of the trap. Removed sediment shall be deposited in a suitable area and stabilized in such a manner that it will not erode.
3. Stabilized Construction Entrance maintenance: The entrances shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. Periodic top dressing with additional aggregate shall be done as needed. All sediment spilled, dropped or washed onto the public area must be removed immediately. When necessary, wheels must be cleaned to remove sediment prior to entrance onto public right-of-ways. All sediment shall be prevented from entering storm drains, ditches or watercourses. Periodic inspection and needed maintenance shall be provided after each rain. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device.

### 3.02 FIELD QUALITY CONTROL

- A. Inspections: The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and areas where vehicles exit the site daily and within 24 hours of the end of any storm that produces 1/2 inch (13 mm) or more rainfall at the site. Where sites have

been finally stabilized, such inspection shall be conducted at least once every month.

1. Inspections Details: Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected by the Contractor for evidence of, or the potential for, pollutants entering the local drainage system. Erosion and sediment control measures identified in the SSCP shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.
2. Inspection Reports: For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SSCP, maintenance performed, and actions taken. The report shall be furnished to the Resident Engineer. A copy of the inspection report shall be maintained on the job site.

### 3.03 CLEANING

- A. Clean all silt and sediment from sumps during and at the conclusion of the Work. Interim cleaning shall be such that the performance of the sump, pumps and piping, used in the performance of work, is not hindered, or at the direction of the Resident Engineer.

-END OF SECTION-

**Section 02380  
ROCK WORKS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work of this section consists of furnishing all transportation, labor, materials, equipment, and incidentals necessary to construct graded stone material for scour backfill, in accordance with the Contract Documents.
- B. This Section includes, but is not limited to, the following items:
  - 1. Gradation of Armor Stone
  - 2. Gradation of Underlayer
  - 3. Testing of Rock
  - 4. Placement of Rock

**1.02 RELATED SPECIFICATIONS**

- A. Section 01356 – Safe and Healthful Working Conditions
- B. Section 02325 – Dredging

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Society for Testing and Materials (ASTM):
    - a. ASTM C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
    - b. ASTM C97 Absorption and Bulk Specific Gravity of Natural Building Stone
    - c. ASTM C127 Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
    - d. ASTM C136 Sieve Analysis of Fine and Coarse Aggregate
    - e. ASTM C170 Compressive Strength of Dimension Stone
    - f. ASTM C295 Petrographic Examination of Aggregates for Concrete

- g. ASTM C535 Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and impact in the Los Angeles Machine
  - h. ASTM D3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
  - i. ASTM D4791 Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
  - j. ASTM D4992 Evaluation of Rock to be Used for Erosion Control
  - k. ASTM D5312 Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions
  - l. ASTM D5313 Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions
- 2. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - 3. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

#### 1.04 DEFINITION

- A. The words "rock" and "stone" used in this Section are interchangeable.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with Article 4 of the General Conditions and Section 01330 - Shop Drawings:
  - 1. Methods and sequences planned to be used in rock placement for review by the Commissioner prior to the shipment of rock.
  - 2. Fifteen days prior to shipment of rock, test samples of rock to be furnished for approval. These samples shall weigh not less than 20 pounds each and shall be delivered in a suitable container.
  - 3. Within 15 days after Notice to Proceed, the source or sources from which the rock will be furnished.

#### 4. Qualifications Submittals

- a. Testing Technicians and Testing Agency: Submit data on qualifications of Contractor's proposed testing agency and technicians for approval by the Commissioner prior to performing any work. Comply with related requirements in paragraph 1.06 herein and Section 01451 - Contractor's Quality Control.

#### 5. Test Reports

- a. Gradation Test: Submit the gradation tests using the GRADATION TEST DATA SHEET enclosed at end of this section.
- b. Evaluation Testing of Stone: Quality test on the stone in accordance with Part 2 article entitled "Source Quality Control". Prior to delivery of such material to the worksite, submit a copy of the laboratory inspection report along with actions taken to correct deficiencies. Submit a copy of the test reports.
- c. Material: Submit test reports attesting that the materials meet specified requirements.
- d. Bulk Specific Gravity: At least 30 calendar days in advance of shipment of stone to the work site, submit a copy of bulk specific gravity test results for each gradation range of stone proposed to be furnished. The information shall be furnished prior to preparation of pre-production demonstration stockpiles.

#### 6. Certificates

- a. Submit certificates of compliance attesting that the materials meet specification requirements.
- b. Laboratory: Submit a copy of the documents that validate that the laboratory can perform the required tests. The individual tests shall be listed for which the validation covers along with the date of the inspection.
- c. Weigh Scale Certification: Submit a copy of the certification from the regulation agency attesting to the scale's accuracy.
- d. Certified Weight Scale Tickets: Submit a copy of each certified weight scale ticket within five working day(s) after weighing.



## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Comply with all applicable Federal, state and local laws and regulations.
- C. Make all arrangements, pay all royalties, and secure all permits for the procurement, furnishing and transporting of rock. The Contractor shall vary quarrying, processing, loading and placing operations to produce sizes and quality of stone specified. If stone being furnished by the Contractor does not fully meet all requirements of these Specifications, the Contractor shall furnish, at no additional cost to the City of New York, other stone meeting requirements of these specifications and remove and dispose of unacceptable rock from the site in accordance with Federal, state and local regulations.
- D. Testing Agency/Laboratory: Engage the services of an independent testing laboratory approved by the Commissioner to perform testing specified to be performed by the Contractor. Testing shall be performed by an approved accredited laboratory. The laboratory to perform the required testing shall be validated based on relevant paragraphs of ASTM D3740, and no work requiring testing shall be permitted until the laboratory has been inspected and validated. The first inspection of the facilities shall be at the expense of the City of New York and any subsequent inspections required because of failure of the first inspection shall be at the expense of the Contractor.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. All rock shall be durable material as approved by the Commissioner. Rock used shall be quarry rock, not rounded or sub-rounded river run and shall be close-grained, hard, sound, clean, and shall not disintegrate from the action of the atmosphere, sea water, handling or placing. The rock shall be free of cracks, blast fractures, bedding, seams and thin layers of soft decomposed or soluble water material and other defects that would tend to increase its deterioration from natural causes. Inspections for cracks, fractures, seams and defects shall be made by visual examination. If, by visual examination, it is determined that 10 percent or more of the stone produced contains hairline cracks, then all stone produced by the means and measures which caused the fractures shall be rejected. A hairline crack that is defined as being detrimental shall have a minimum width of 4 mils and shall be continuous for one-third the dimension of at least two sides of the stone. The stone shall be clean and free from all foreign matter. Remove any foreign material adhering to or combined with the stone as a result of stockpiling prior to placement.

- B. Tests and service records shall be used to determine the acceptability of sample rock materials submitted. The rock may be subjected to the following tests: petrographic analysis, specific gravity, abrasion, absorption/porosity, weatherability, soundness, compressive strength, wetting, and drying to demonstrate the material is acceptable for the use intended. Test requirements are specified in Article 2.04.
- C. Rock which does not conform to specific gravity, structure, and other characteristics specified shall be rejected. The presence of unsatisfactory rock or objectionable foreign material shall be sufficient reason for rejection of the entire load of rock. Such load of rock shall be removed from the work and disposed of at the Contractor's expense.
- D. Sources: Furnish stone from a source designated by the Contractor and accepted by the Commissioner, subject to the conditions herein stated. Satisfactory service records on other work may be acceptable proof of suitability. Approval of a stone source shall not be construed as a waiver of the right of the Commissioner to require the Contractor to furnish stone which complies with these Specifications. Materials produced from localized areas, zones or strata of an approved quarry will be rejected when such materials do not comply with these Specifications. In order for stone to be acceptable on the basis of service records, stone of a similar size must have been placed in a similar thickness and exposed to weathering under similar conditions as are anticipated for this Contract, and must have satisfactorily withstood such weathering for a minimum of 20 years. In addition to an acceptable 20 year service record, the Commissioner has the option to elect to have representative samples taken and tested.
  - 1. Selection of Source: The Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish stone. It is the Contractor's responsibility to determine that the stone source or combination of sources selected is capable of providing the quality, quantities and gradation needed and at the rate needed to maintain the scheduled progress of the work.
  - 2. Acceptance of Materials
    - a. Acceptance of a source of stone is not to be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Commissioner.
    - b. The Commissioner also reserves the right to reject individual units of produced specified materials in stockpiles at the quarry, all transfer points, and at the project construction site when such materials are determined to be unsuitable.

- c. During the course of the work, the stone may be tested by the Commissioner, if he/she determines that testing is necessary. If such tests are determined necessary, the testing will be done in a commercial laboratory selected by the Commissioner.
  - d. Materials produced shall meet all the requirements herein. The cost of testing will be at the Contractor's expense. During the contract period, both prior to and after materials are delivered to the job site, visual inspections and measurements of the stone materials may be performed by the Commissioner. If the Commissioner, finds that the stone quality, gradation or weights of stone being furnished are not as specified or are questionable, re-sampling and re-testing by the Contractor shall be required.
  - e. Sampling of the delivered stone for testing and the manner in which the testing is to be performed shall be as directed by the Commissioner. This additional sampling and testing shall be performed at the Contractor's expense when test results indicate that the materials do not meet specified requirements. When test results indicate that materials meet specified requirements, an equitable adjustment in the contract price will be made for the sampling and testing. Any material rejected shall be removed or disposed of as specified and at the Contractor's expense.
- E. Quarry Operations: Quarry operations shall be conducted in a manner that will produce stone conforming to the requirements specified and may involve selective quarrying, handling, processing, blending, and loading as necessary, all of which shall be as specified in Section 01451, "Contractor Quality Control".
- 1. Blasting and handling of rock shall be controlled to produce rock of the size ranges and quality specified. Techniques such as the use of proper hole diameter, hole depth, hole angle, burden and spacing distances, types and distribution of explosives, blast delay intervals and sequence, removal of muck piles between each shot, and special handling techniques are required as necessary to produce the specified materials. All aspects of blasting operations shall be specifically designed so that the end-product is not damaged from the blasting technique and that the stone is suitable for the intended purpose.
  - 2. Curing Stone: Conduct curing operations on freshly quarried stone to allow it to release stored energy and moisture and to allow the stone to demonstrate that it will not fracture during the energy release and drying-out phase. Temporarily stockpile stones of sizes which are individually picked at the quarry site a minimum of 90 calendar days before being shipped to the project site, unless this requirement is waived by the Commissioner. Such waiver will be granted only if the stone has characteristics that make curing unnecessary.

3. Temporary Storage at Quarry: Storage of stone materials subsequent to shipment from the quarry and prior to permanent placement in the required work shall be subject to approval of the Commissioner. Underwater storage of stone materials is prohibited.
4. Proportional Dimension Limitations: Stone in size ranges which are not graded with a screen or grizzly shall have ratios of their dimensions limited as follows:

Definitions:

L = largest dimension (length),

G = largest dimension measured perpendicular to the direction of L

E = largest dimension perpendicular to plane LG < G

Requirements:

$(L+G)/2E \leq 3$  and  $L/E < 3$  for 95% of stone by weight

$(L+G)/2E \leq 2.5$  and  $L/E < 2.5$  for 75% of stone by weight

- F. Rock Armor Material Stockpiles: Storage of Rock Armor material at the worksite is not to be confused with off-site stockpiling of Rock Armor material. If the Contractor elects to provide off-site stockpiling areas, the Commissioner shall be notified by the Contractor of all such areas. The Contractor's stockpile shall be a maximum of 12 feet high and formed by a series of layers of truckload dumps, where the rock essentially remains where it is placed. Subsequent layers shall be started 10 feet from the edge of the previous layer so that the rock will not roll down the edges of the previous layers. The first layer shall be a maximum of 6 feet high. After being stockpiled, Rock Armor material which has become contaminated with soil or refuse shall not be put into the work unless the contaminating material has been removed prior to placement.
1. Worksite Stockpile: Rock Armor material delivered to the work site, which requires temporary storage landward of top of slope, shall be placed in a container suitable for storing the Rock Armor material without waste, or a sand-clay-gravel or crushed stone pad may be constructed for the storage area and removed upon completion of the work. If the sand-clay-gravel or crushed stone pad method is used, the pad shall have a minimum thickness of at least 6 inches. The container or sand-clay-gravel or crushed stone pad method shall be subject to approval prior to delivery of the Rock Armor material. Upon completion of the work, the storage areas shall be cleaned of all storage residues and returned to their natural condition. Temporary storage of material at the worksite will be allowed, provided the amount does not exceed 200 tons unless otherwise approved.
  2. Off-site Stockpile: In areas where Rock Armor material is stockpiled for placement, the area shall have excess rock removed prior to completion of work. All rock and spalls greater than 3 inches in diameter shall be removed. Where rocks may have become buried due to soft ground or

operation of the equipment, the rock shall be put in a disposal area. After the rock has been removed, the storage area shall be graded, dressed and filled to return the ground surface as near as practical to the condition that existed prior to construction, unless otherwise approved in writing by the site owner.

## 2.02 GRADATION OF UNDERLAYER

- A. Each load of underlayer shall have uniform grading from fine to coarse particles to achieve the grading identified in this Section.
- B. Underlayer shall consist of material conforming to the following gradation by weight; typical sizes listed are approximate and are provided for guidance only:

Weight of Pieces (lbs)	Typical Size (inches)	Percent smaller than by weight
4.6	3.6	97%
2.8	3.0	75% to 90%
0.7 to 0.9	2.0	50%
0.2	1.4	0 to 15%
0.1	1.2	2%

## 2.03 GRADATION OF ARMOR STONE

- A. Armor stone shall be select, angular, quarried rock that is reasonably well-graded with grading by weight as tabulated below. Typical sizes listed are approximate and are provided for guidance only.

Armor Stone Type I		
Weight of Pieces (lbs)	Typical Size (inches)	Percent smaller than by weight
60	9	97%
50	8	75 to 90%
20 to 30	6	50%
10	5	0 to 15%
5	4	2%

Armor Stone Type II		
Weight of Pieces (lbs)	Typical Size (inches)	Percent smaller than by weight
600	19	97%
500	17	70% to 100%
360 to 440	16	50%
200	13	0 to 10%
120	11	2%

Armor Stone Type III		
Weight of Pieces (lbs)	Typical Size (inches)	Percent smaller than by weight
1050	22	97%
875	21	70% to 100%
630 to 770	19	50%
350	15	0 to 10%
210	13	2%

## 2.04 SOURCE QUALITY CONTROL

- A. General: Source inspection will be performed by the Commissioner. The Contractor shall assist and provide access for inspection by the Commissioner. Testing as specified herein shall be performed by the Contractor's approved testing laboratory. Testing and associated costs, including shipping of test samples, shall be at the Contractor's Expense and at no additional cost to the City of New York. Any test not meeting the requirements specified shall be re-performed at the Contractor's Expense. Test results shall be submitted for approval at least 30 days before stone will be required for installation in the work.
- B. Pre-Production
1. Material Quality: Before selecting a source for preparation of a demonstration stockpile, the Contractor shall be reasonably certain that the source is capable of meeting the quality and source requirements specified herein.
  2. Borderline Material Quality: If the Commissioner's evaluation of a demonstration stockpile results in his/her not being able to determine by visual examination whether the material is acceptable, the Commissioner will select at least one, but not more than three, representative stones from the demonstration stockpile to be prepared for shipment to the Commissioner's laboratory for testing in accordance with paragraph 2.04C. For specified stone sizes more than 500 lbs, individual samples shall be the size of the largest stone specified for the size range. Samples of stone groupings with a maximum size less than 500 lbs shall contain at least two (2) stones representative of the higher limit of the stone weights specified. In addition, the sample shall be representative of the gradation specified and the minimum weight of the total sample shall be not less than 500 lbs. The sampling and testing procedures shall be repeated for each strata being quarried. The Contractor shall ship the samples to the laboratory as specified in paragraph 2.04C. If the laboratory testing reveals the materials are unacceptable, the Contractor shall submit a replacement source for approval and proceed with the demonstration stockpile procedures anew.

3. **Demonstration Stockpile at Source:** Following submittal of the Contractor's Quality Control (CQC) Plan and the Contractor's selection of a source, but prior to the Commissioner's approval of a source and the CQC Plan, the Contractor shall arrange to provide a pre-production demonstration stockpile for each of the stone size ranges for the project. The stockpiles shall be located at the source of the stone and be shaped in windrow fashion. Stones shall not be stacked higher than 4 feet. The stones placed in the demonstration stockpiles shall be representative of the overall quality of materials in the source. The stones shall not consist of the best specimens unless it is reasonable to determine that the source will provide the required amount of stone of the applicable size range with a degree of quality no less than that existent in the demonstration stockpile. The quantity of stone in each demonstration stockpile shall be dependent upon the gradation size range to be produced for the project.
4. The stones placed in the stockpile shall have been preselected by the Contractor's Quality Control Plan (CQCP) inspector or supervisor and acceptable stones over 500 lbs in size shall have been marked with spray paint on three mutually perpendicular sides with a coded mark to denote acceptability for a certain size range. A stockpile of representative reject stones marked with a red "X" shall also be maintained at the site as examples of unacceptable materials or shapes.
5. **Evaluation of Demonstration Stockpile at Source**
  - a. The Contractor shall notify the Commissioner when stockpiles are ready for evaluation.
  - b. The Contractor's approved Quality Control Plan (QCP) supervisor and all QCP inspectors shall accompany the Commissioner during his/her evaluation of the demonstration stockpiles.
  - c. The Contractor shall arrange to have individual stones turned as necessary to accommodate the Commissioner's evaluation.
  - d. The Commissioner will mark rejected stones with a red "X" and such stones shall be removed to the reject stockpile or to a crusher if one is available.
    - (1) If more than two (2) unacceptable stones are found within a stockpile, the entire stockpile will be rejected by the Commissioner and a replacement stockpile shall be created for re-evaluation.
    - (2) If the replacement stockpile is rejected, the Contractor shall revise and resubmit its Quality Control Plan (QCP) and shall

create another replacement demonstration stockpile for evaluation.

- (3) If the third demonstration stockpile for a particular size range at a single source is found unacceptable, the source will be disapproved for such size range and a new source shall be submitted for approval. In addition, the Contractor shall submit the name and qualifications for a person to replace the QCP supervisor.
  - (4) The Contractor may choose a replacement source at the time a first or second demonstration stockpile is found unacceptable.
  - (5) The replacement of demonstration stockpiles or stone sources shall be at no additional cost to the City of New York and with no change in the time of completion.
6. Approval of Demonstration Stockpile at Source: At the time the Commissioner finds the contents of a demonstration stockpile to be acceptable, either through visual examination or through laboratory testing, the Contractor will be notified in writing that the source, the QCP plan and QCP staff are approved. Upon approval, the Contractor may proceed with production of materials for the project provided they are consistent with demonstration stockpiles.
7. Duration of Demonstration Stockpile at Source: Other than for being shipped as the final quantities of materials to be placed in the work, each demonstration stockpile shall remain unchanged at the source until all other required material of the size range represented by the stockpile has been shipped from the source.

C. Evaluation Testing of Stone

1. Samples: Take samples of stone from by a representative of the quarry under the supervision of the Commissioner for testing and acceptance prior to delivery of any stone from this source to the site of the work. Information provided with the samples shall include the location within the quarry from which the sample was taken along with a field examination of the quarry. The field examination shall include the information outline in ASTM D4992, paragraph 7. Samples shall consist of at least three pieces of stone, roughly cubical in shape, from each unit that shall be used in the production of the required stone. For smaller size gradations, the sample stones shall be of the maximum size; for large size gradations, the sample stones shall weigh not less than 150 lbs. each. If the source is an undeveloped quarry, or if the operation has been dormant for more than one year such that fresh samples are not available, the quarry shall expose fresh rock for 20 feet horizontally and for the full



height of the face proposed for production, prior to the field evaluation. The Commissioner may also require documentation of subsurface exploration of an undeveloped quarry in order to determine whether sufficient reserves are available. The samples shall be shipped at the Contractor's expense to a laboratory validated by the Commissioner to perform the required tests.

2. The tests shall be conducted by the Contractor in accordance with applicable ASTM methods, and shall be performed at a laboratory approved by the Commissioner. The cost of testing shall be borne by the Contractor.
3. Perform evaluation tests on stone samples collected from the proposed source. Perform the quarry investigation by a registered geologist or registered Commissioner. The tests to which the stone shall be subjected include petrographic examination (ASTM C295), absorption (ASTM C127), resistance of stone to freezing and thawing (ASTM D5312), and resistance to wetting and drying (ASTM D5313).
4. Each load of rock shall meet the requirements of testing methods specified. The Commissioner reserves the right to test any loads of rock at any time.
5. The following tests shall be performed and test results shall meet the requirements stated:
  - a. Abrasion Resistance (Los Angeles): ASTM C535 - Maximum abrasion loss by this method using Grading 1 shall not exceed 9 percent after 100 revolutions and 38 percent after 500 revolutions.
  - b. Specific Gravity: ASTM C97 with the following modifications:
    - (1) Sample rocks shall be selected for testing by the Commissioner. If, in the judgment of the Commissioner, a sample rock is too large to be handled conveniently, it may be broken into two or more pieces and one or more of these selected for testing. The sample rocks shall be dried 24 hours or more at 220 degree F. to 230 degree F. Soil or loose material shall be removed with a stiff brush. Immediately upon cooling, the rocks shall be weighed to an accuracy of  $\pm 1$  percent. After weighing, the specimens shall be completely immersed in clean tap water for a minimum period of 48 hours and then weighed in clean tap water to an accuracy of  $\pm 1$  percent. The specimens shall then be surface dried with a towel to remove excess surface moisture, and immediately weighed in air to an accuracy of  $\pm 1$  percent.

- (2) Quantity determinations are contingent upon the range of bulk specific gravity (saturated surface dry (SSD) basis) of stone to be supplied. Therefore, during the process of selecting a source or sources of stone for the project, the Contractor shall make an investigation to determine the lowest and highest bulk specific gravity (SSD) of stone available at the source or sources he proposes to utilize for each gradation range of stone. Test results that display an extraordinarily wide range of values may necessitate additional testing to determine whether the source contains strata with stones of an acceptable range of bulk specific gravity.

- (3) Specific Gravity shall be calculated (oven-dry basis) as follows:

$$SG = A \div (B - C)$$

Where:

A = weight of oven-dry sample in air.

B = weight of soaked and surface dried sample in air.

C = weight of soaked sample in water.

- (4) The average (arithmetic mean) of all values obtained from tests performed on any load of rocks shall equal or exceed 2.6.

- c. Absorption: Tests for absorption shall be in accordance with ASTM C127 except the unit weight shall be calculated in accordance with Note No. 5 using bulk specific gravity, saturated surface dry, with an acceptable limit of two percent, unless other tests and service records show that the stone is satisfactory.
- d. Sulphate Soundness: When subjected to five cycles of the soundness test specified in ASTM C88 using magnesium sulphate solution, the rock shall not have a loss greater than 12 percent.
- e. Petrographic Analysis: Stone shall be subjected to petrographic and X-ray diffraction analysis in accordance with ASTM C295 which shall include information required by ASTM D4992, paragraph 10. Stone shall not contain expansive clays.
- f. Resistance of Rock to Wetting and Drying: Stone shall have a maximum loss of 1 percent when determining the durability of stone when subject to wetting and drying in accordance with ASTM D5313.
- g. Drop Test: A drop test provides an immediate evaluation of the durability of very large stone during handling of the stone including placement into a structure. For comparability, the test stone(s) shall

be dropped from a bucket or by other means from a height of not less than half the average diameter of the stone onto a rigid surface or second stone of comparable size. Dumping from a truck is not acceptable. The stone shall be examined carefully before as well as after the completion of the test. Failure criteria are the development of new cracks, opening of old cracks, and the loss of a piece from the surface of the stone. Each stone shall be dropped a total of five times for evaluation purposes with examination after each drop. The Contractor shall provide all necessary equipment and operating personnel to help perform the testing.

- h. Unconfined compression test (ASTM C170), measured on cubes with 2-inch edges:  $\geq 5000$  psi for underlayer;  $\geq 7000$  psi for armor stone
- i. Gradation Tests of Underlayer and Rock Armor material:
  - (1) The sample shall be taken by the Contractor in the presence of the Commissioner. The Contractor shall notify the Commissioner not less than 3 days in advance of each test. In the event of unavailability of the Commissioner, the Contractor shall perform the tests and certify to the Commissioner that the Underlayer and Rock Armor material shipped complies with the specifications.
  - (2) At least one gradation test(s) shall be performed per 5,000 tons of each size of Underlayer and Rock Armor material placed, but not less than one test shall be performed.
  - (3) The gradation tests shall be reported using the forms GRADATION TEST DATA SHEET and RIPRAP GRADATION CURVES, attached at end of this Section. The Contractor shall designate on the test form that portion in tons of the lot tested that is applicable to this contract. Any deviation from the reported tonnage shall be corrected and recorded on a revised GRADATION TEST DATA SHEET.
  - (4) Sampling and gradation testing for underlayer stone shall conform to ASTM C136.
  - (5) For each type of armor stone, the sample shall consist of not less than 40 pieces of stone, and shall be collected in a random manner that will provide a sample that accurately reflects the actual gradation arriving at the jobsite.
    - (a) The weight of the individual pieces of armor stone, representing the minimum, maximum and 50 percent

greater than sizes for the specified armor stone gradation, shall be printed on each stone and be placed at the quarry to provide visual comparison during production at the quarry. They shall be placed in a location adjacent to the work site in order to provide a basis for visual comparison during placement of the armor stone. These stones shall be used as the last order of work. Failure of the test on the initial sample and on an additional sample will be considered cause for rejection of the quarry and/or quarry process, and all Underlayer and Rock Armor material represented by the failed tests shall be set aside and not incorporated into the work. Any additional tests required because of the failure of an initial test sample will not be considered as one of the other required tests.

- (b) If collected by the truckload, each truckload shall be representative of the gradation requirements. The Commissioner may direct additional testing of the Underlayer and Rock Armor material at the project site if the Underlayer and Rock Armor material appears, by visual inspection, to be out of gradation. The additional tests shall be performed on random loads selected by the Commissioner.
- (c) If the gradation test fails, additional gradation tests will be required at the Contractor's expense to delineate the limits of unacceptable stone. The additional gradation tests shall not count as part of the minimum number of gradation tests required. Either the unacceptable stone shall be reworked to bring the stone within the specified gradation or the stone shall be removed from the project site as determined by the Commissioner. The Commissioner may direct this testing.
- (d) The Contractor shall provide all necessary screens, scales and other equipment, and operating personnel, and shall grade the sample. Certification and test results shall represent Underlayer and Rock Armor material shipped from the quarry.
- (e) Certification and tests results must be received by the Commissioner at the jobsite before the Underlayer and Rock Armor material is used in the work.

- D. Test Quarry Samples: Samples for testing, shall be submitted a minimum of 30 days in advance of the time when the stone will be required in the work. Stone from the proposed source shall be tested for quality compliance at the

Contractor's expense by a laboratory approved by the Commissioner. Test samples (500 pounds minimum) shall be representative of the respective stone sources and shall be obtained by the Contractor under the supervision of the Commissioner and delivered at the Contractor's expense to an approved testing laboratory.

- E. Re-certification and Testing: Sampling and testing of any load of material delivered to the project site shall be at the Commissioner's discretion, randomly chosen up to a maximum of five tests. Costs for testing shall be at the Contractor's expense and included in the unit prices for rock.
- F. Random Testing By Commissioner: The Commissioner reserves the right to require, at random, additional rock samples to be tested at the Commissioner's discretion. Rock samples may be taken at the quarry site or from deliveries at the worksite. This testing will be performed at the City of New York's expense. The Commissioner reserves the right to have a representative at the quarry site to observe the work. At any time, during the progress of the work, the Commissioner may undertake tests on any rock material intended for shipment and use on the project.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Depth and extent of rock work shall be within limits shown on the Contract Drawings. Slopes and elevations indicated on the Contract Drawings are to be interpreted as irregular surfaces. Comply with the following:
  - 1. Rock materials shall be placed by a method selected by the Contractor and reviewed by the Commissioner.
  - 2. Care shall be exercised when placing rock materials near adjacent structures. Damage shall be repaired at the Contractor's expense.
  - 3. Rock materials shall be placed on the slope of the underlying surface as soon as possible after it is dredged, but not later than 7 days after approval of dredging survey.

#### 3.02 PREPARATION

- A. Prior to placing each type of rock material, the Contractor shall verify that the underlying surface has been surveyed and approved by the Commissioner.
- B. Debris: Remove any timbers, unsatisfactory material and debris within the reaches for construction except as otherwise directed by the Commissioner. Upon removal, debris shall become the property of the Contractor. All materials shall be properly disposed of in accordance with the requirements of

Section 02222 – Demolition and Removals and Section 02224 – Removal of Arsenic-Impacted Wood, Environmental Requirements, as applicable.

### 3.03 TOLERANCES

- A. Rock work shall be carried to lines, grades and with minimum layer thicknesses as shown on the Contract Drawings and as directed by the Commissioner. Layer thicknesses may locally exceed those shown by up to 25%. Final surface of each finished course shall follow with reasonable variation the indicated lines and grades without continuous under or overbuilding.

### 3.04 MISPLACED MATERIAL

- A. Any material that escapes or is lost at any time while loading, transporting or placing rock, or which is deposited other than in an area designated on the Contract Drawings, or change approved in writing by the Commissioner, shall be removed and re-deposited where directed by the Commissioner, at the Contractor's expense.

### 3.05 MAINTENANCE OF UNDERLAYER

- A. Exposed underlayer surfaces are vulnerable to damage until all stone has been placed and rock work has been accepted. The Contractor shall be responsible for care and maintenance of these slopes until final acceptance by the Commissioner. Damage to rock slopes due to any cause prior to acceptance shall be repaired, at the Contractor's expense.

### 3.06 ROCK PLACEMENT PROCEDURE

- A. The armor stone and underlayer shall be placed so that a reasonably well-graded mass is produced with a minimum practicable percentage of voids. Rock layers shall be constructed to lines and grades indicated on the Contract Drawings. Armor stone shall be placed to its full course thickness in one operation and in a manner which will avoid displacing underlayer stone. Stone shall be allowed to fall no more than three feet from bottom of clam or other bucket and top surface of rockwork for work three feet below water surface or above.
- B. Placing Underlayer Stone: Place the underlayer stone in a manner to produce a resultant graded mass of stone with minimum voids. Rearranging of individual stones may be required to achieve this result. Placement by any method that is likely to cause segregation of the various sizes will not be permitted. Lower un-segregated stone in a bucket or container and placed in a systematic manner directly on the underlying material. Begin placement at the bottom of the slope and proceed upward. Moving the stone by drifting and manipulating down the slope will not be permitted. Final finish of the slope shall be performed as the material is placed

**C. Placing Armor Stone**

1. Perform final shaping of the slope concurrently with the initial placement of the stone.
  2. Randomly select stones and set in contact with each other so that the interstices between adjacent stones are as small as the character of the stone will permit.
  3. Place the face of stone having the largest area against the surface of the underlying material. Begin placement at the bottom of the slope. Place the heaviest stones as toe stones.
  4. Place stones in a manner to avoid displacing underlying materials or placing undue impact force on underlying material that would cause the breaking of stones.
  5. Use suitable equipment in placing the stone for handling materials of the sizes required including the ability to place the stone over its final position before release and if necessary pick up and reposition the stone. Dragline buckets and skips shall not be used in placement. Moving stone by drifting or manipulating down the slope will not be permitted.
  6. The finished work shall be a well-distributed mass, free of pockets of either smaller or larger stone, having a minimum of voids and with the maximum of interlocking of stones.
  7. It should be anticipated that re-handling of individual stones after initial placement will be required to achieve the above requirements. Stones placed within 10 feet adjacent to existing marina wall shall not be dropped, but gently lowered and placed in their final position by material handling equipment.
- D. For underwater work, where work surface is more than five feet below water level, maximum drop shall be five feet. That notwithstanding, an otherwise allowable height using the Contractor's approved placement method will not be permitted if it is shown to cause segregation of rock sizes, or breakage of individual stones. In those cases, allowable drop heights will be developed on-site, between the Commissioner and the Contractor, based on actual performance.
- E. The Contractor shall maintain armor layer until accepted and any material displaced, or with damage to surface by any cause, shall be replaced to indicated lines and grades, at the Contractor's expense.
- F. Self propelled equipment shall not be used on slopes. Placing armor stone by dumping into chutes or similar methods will not be permitted.

- G. Slides: In the event of the sliding or failure of any part of the structure during its construction, or after its completion, but prior to its acceptance, the Contractor shall, upon written order of the Commissioner, cut out and remove the slide from the structure. The Contractor shall then rebuild that portion of the structure with new materials or reuse the displaced materials for rebuilding if deemed appropriate. The Commissioner will determine the nature and cause of the slide. In case the slide is caused through fault of the Contractor, the foregoing operations shall be performed without additional cost to the City of New York.

### 3.07 WORKING AROUND STRUCTURES

- A. The Contractor shall exercise great care in when working around existing and newly constructed structures. The installation of underlayer and top armor rock shall be completed prior to installation of the fender units. Any damage to fender units and pilings as a consequence of the Contractor's rock placement works shall be repaired by the Contractor at the Contractor's expense.

### 3.08 ADJUSTING AND CLEANING

- A. Surveys will be conducted by the Commissioner before and after placing each layer of rock in the work. Surveyed sections will be taken at a spacing not greater than 50 feet along the long axis of active work face, plus a longitudinal centerline profile. Each section will define sufficient points to accurately represent rock in place.
- B. If, in the opinion of the Commissioner, additional rock is required to conform to the sections shown on the Contract Drawings, the Contractor shall, when directed by the Commissioner, return to the areas requiring such additional rock and place same without additional compensation.
- C. Rock or material misplaced and judged objectionable by the Commissioner shall be removed at the Contractor's expense prior to acceptance of the job. Misplaced material not judged objectionable may remain.

### 3.09 FIELD QUALITY CONTROL

- A. General: Field inspection will be performed by the Commissioner. Contractor shall assist and provide access to the work area for field inspection by the Commissioner.
- B. Placement Control
  - 1. Quality Control Measures: Establish and maintain quality control for all work performed at the job site under this section to assure compliance with contract requirements. Maintain records of his quality control tests, inspections and corrective actions. Quality control measures shall cover all



construction operations including, but not limited to, the placement of all materials to the slope and grade lines shown and in accordance with this section.

2. Check Surveys: Surveys made by the Contractor are required on each material placed for determining that the materials are acceptably placed in the work. Make checks as the work progresses to verify lines, grades and thicknesses established for completed work. Make at least one (1) check survey as specified below for each 25 foot section as soon as practicable after completion. Following placement of each type of material, the cross section of each step of the work shall be approved by the Commissioner before proceeding with the next step of the work. Approval of cross sections based upon check surveys shall not constitute final acceptance of the work. Cross sections shall be taken on lines 30 feet apart, measured along the structure baseline, with readings at 5 foot intervals and at breaks along the lines. However, other cross section spacing and reading intervals may be used if determined appropriate by the Commissioner. Take additional elevations and soundings as the Commissioner may deem necessary or advisable. Conduct the surveys in the presence of the Commissioner, unless this requirement is waived by the Commissioner.
  - a. Above Water: Determine the elevation of stone above the water surface by the use of a leveling instrument and a rod having a base 12 inches in diameter. If approved by the Commissioner, other means may be used.
  - b. Below Water: For portions of the work that are under water, perform sounding surveys either by means of a sounding pole or a sounding basket weighing about 10 lbs, each of which has a base measuring 12 inches in diameter.
  - c. Gage Board: Install a gage board to measure tides at the project site. Check the gage prior to any survey.
  - d. Electronic Depth Recorder Method: When using an electronic depth recorder, conform to the following requirements:
    - (1) The survey depth recorder used must be a standard model acceptable to the Commissioner using a sounding chart that can be read directly to the nearest foot and estimated to the nearest inch. Accuracy shall be better than 1/2 of 1 percent.
    - (2) Calibrate the depth recorder to adjust for tide level every 30 minutes.

- (3) Perform further calibrations whenever there is any malfunction within the depth recorder or transducer that might affect the soundings, or when there is a lengthy disruption.
- (4) Calibrate the depth recorder every 2 hours by comparison to a manual sounding using a check bar. Obtain the check bar reading at approximately the deepest location in the area to be sounded.
- (5) Calibrate the depth recorder to read at project datum.
- (6) Under no circumstances shall the setting of the depth recorder be changed between calibrations.
- (7) Speed of the Sounding Boat: When sounding, the speed of the sounding boat shall be as constant as possible, preferably between 2 to 2.5 mph.
- (8) Record calibrations on the sounding chart or in the field notes.

### 3.10 ACCEPTANCE

- A. Underlayer: Acceptance of underlayer work will be for the completed lift of underlayer rock material when constructed to lines and grades shown on the Contract Drawings. Smaller sections may be allowed by the Commissioner based on geometry, length or other factors related to work. Each section of work will be accepted when constructed to lines and grades shown on the Contract Drawings with due allowances for specified tolerances.
- B. Armor Stone: Work will be accepted when all stone of a particular gradation has been placed to lines and grades shown on the Contract Drawings with due allowances for specified tolerances.

## GRADATION TEST DATA SHEET

Quarry	Type of Stone Tested
--------	----------------------

Date of Test \_\_\_\_\_ Testing Rate \_\_\_\_\_

**TEST            REPRESENTS**

Contract No.

**District**

**Tens**

**TOTAL**

## GRADATION

**Stone Size  
(lbs)**

**Weight  
Retained**

**Individual  
Retained**

Cumulative	
% Ret.	% Pass

Specification  
# Finer by wt

Total Weight					
Max Size					
Stone -					

Remarks:

I certify that the above stone sample is representative of the total tonnage covered by this test report.

**Contractor Representative**

Government Representative

**Figure 1: Sample Gradation Test Data Sheet**

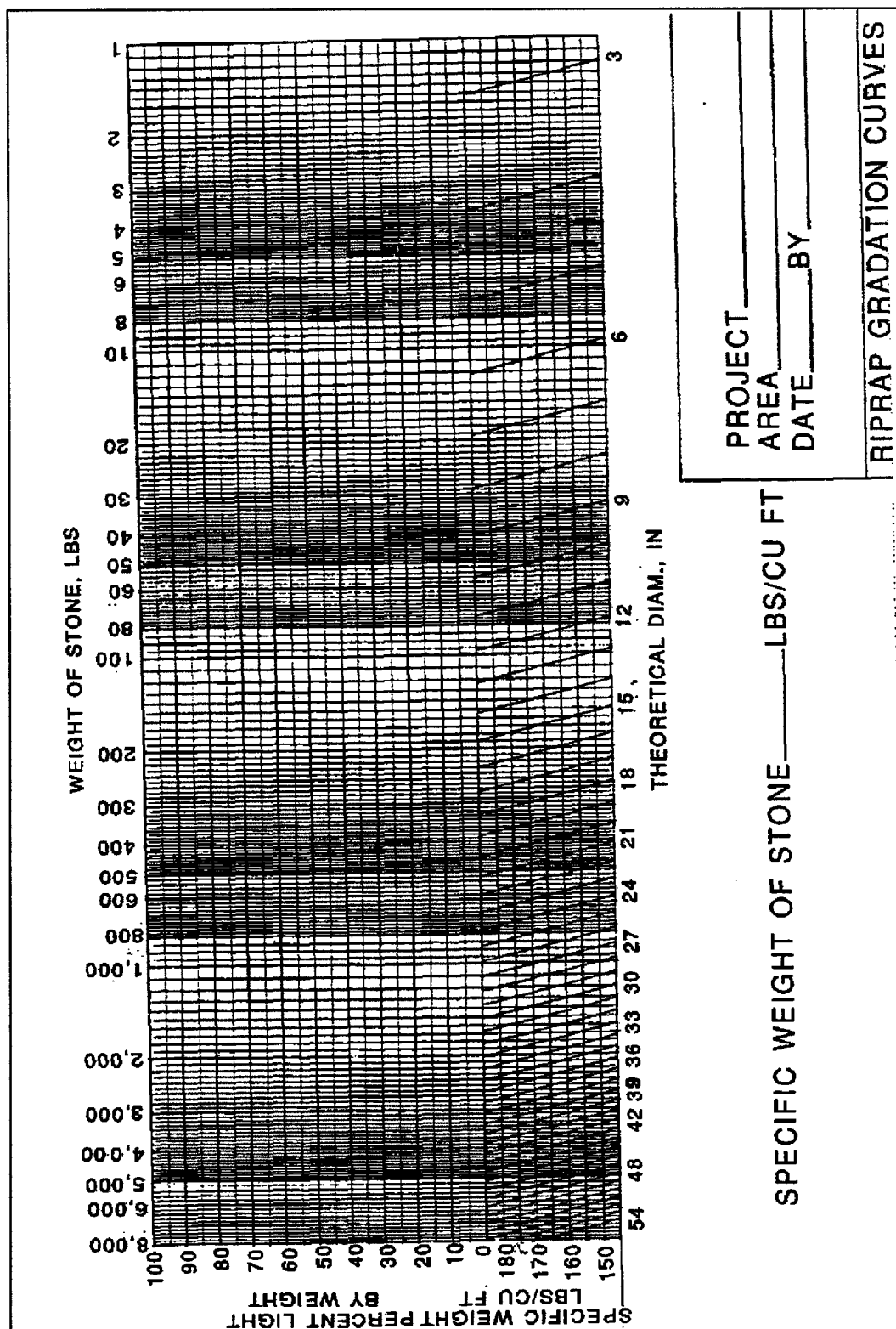


Figure 2: Sample Riprap Gradation Curves

-END OF SECTION-

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**Section 02390**  
**FENDER PILES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of providing all labor, materials, equipment, plant and incidentals required to complete all fender piling work to the limits as shown on the Contract Drawings or as directed by the Commissioner to provide the required support for the fender system. Work includes, but shall not be limited to, steel fender piles as indicated on the Contract Drawings.
- B. Timber fender piles are not included in this Section but shall conform to the requirements of Section 02464 – Marine Timber Piles.
- C. Steel fender piles shall be installed in the field in accordance with the Contract Drawings and within the specified tolerances.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02464 - Marine Timber Piles
- B. Section 02396 - Marine Fendering
- C. Section 05500 - Metal Fabrications
- D. Section 05120 - Structural Steel
- E. Section 09967 - Coatings for Steel Waterfront Structures

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Society for Testing and Materials (ASTM)
    - a. ASTM A6, General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
    - b. ASTM A27, Steel Castings, Carbon, for General Application.
    - c. ASTM A123, Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
    - d. ASTM A153, Zinc Coatings (Hot Dip) on Iron and Steel Hardware.

- e. ASTM A193, Alloy-Steel and Stainless Steel Bolting Material for High Temperature or High Pressure Service and Other Special Purpose Applications.
  - f. ASTM A194, Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
  - g. ASTM A572, High Strength Low-Alloy Columbium-Vanadium Structural Steel.
2. American Welding Society (AWS)
- a. AWS D1.1, Structural Welding Code.

#### 1.04 SUBMITTALS

- A. The Contractor shall submit, under the provisions of Section 01330, Shop Drawings, the following information at least 2 weeks prior to the start of work:
- 1. Shop Drawings: Indicate details and schedules of pile installation to suit design requirements, including pile driving shoes and splicing procedures.
  - 2. Manufacturer's mill certificates for steel piles, driving shoes (if used) and all welded attachments.
  - 3. Descriptions of proposed methods and equipment to be used for pile installation, including but not limited to, leads, driving frame and/or template and pile hammers, including associated appurtenances such as pile cushions.
  - 4. Descriptions of proposed welding procedures and materials for all welded joints.
  - 5. Welders Certificates for welders employed on the Work, verifying AWS qualification within the previous 12 months.
  - 6. Manufacturer's material safety data sheets for coatings, solvents, and other potentially hazardous materials.
  - 7. For each type of coating furnished, submit the manufacturer's or supplier's certifications that products meet specified requirements.

8. Qualifications Submittals: Submit evidence of qualifications including a list of similar projects Contractor or his/her specialty Subcontractors has completed, along with the Owner's contact persons for those projects demonstrating experience meeting the requirements of Article 1.05 for:
  - a. Installer
  - b. Coating applicator
  - c. Contractor's Professional Engineer
  - d. Contractor's Professional Geotechnical Engineer
9. Submit items required by related Sections.
10. Description of proposed method and equipment to be used in measuring placement tolerances of piles.
11. In addition, the Contractor shall submit the following items as work progresses:
  - a. Submit copies of pile driving records for each pile to the City of New York within 2 days after driving. Include information as noted in Article 3.07.

#### 1.05 QUALITY ASSURANCE

- A. Provide the services of a general contractor or a specialty subcontractor that specializes in the installation of steel fender piles and can demonstrate at least three years of relevant experience in the installation of steel fender piles under similar conditions.
- B. Design and select pile components under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of New York.
- C. Selection of pile driving equipment and installation of piles shall be under the direction of an experienced Professional Geotechnical Engineer licensed in the State of New York.

#### 1.06 DRIVING EQUIPMENT

- A. Provide pile driving equipment of type generally used in standard driving practice, operated at manufacturer's specified rate, to develop required rated energy per blow.
- B. Provide driving hammers of sufficient capacity, size and type to deliver consistently effective dynamic energy, suitable to piles to be driven and to subgrade material into which they are to be driven, when operating at not less than 75% efficiency of rated driving energy.



- C. Equip hammer with cast steel or structural steel driving cap, with grooved base conforming to pile shape. Keep bearing surfaces of grooves true and smooth.
- D. Use fixed or rigid type pile driver leads that will hold pile firmly in position and alignment, and in axial alignment of hammer.
- E. Provide a driving frame of sufficient size and rigidity to assist in keeping piles at planned location and plumbness. The driving frame shall have a minimum of two levels of support located a minimum of 15 feet apart.

#### 1.07 PILE DELIVERY, STORAGE AND HANDLING

- A. Ship, handle, and store piles without distortion or damage. Store piles in orderly groups in a clean, properly drained location above ground and block them. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Protect piling to prevent damage to coatings and to prevent corrosion prior to installation. Piles bent during storage beyond tolerance limits will be considered distorted and may not be used in the work.
- B. Handle piling using handling holes or lifting devices. Handle piles with slings and sufficient pick up points to prevent excessive deformations which could result in overstress or coating damage.
- C. Configuration of piling storage should facilitate required inspection activities.
- D. Any damage to steel shall be repaired to the satisfaction of the Commissioner at no additional cost to the City of New York.

#### 1.08 PROJECT CONDITIONS

- A. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available as described in Section 01120 –Contract Summary. The Contractor may use this report to establish the quality of materials expected to be present at the project site.
- B. The Contractor is responsible for any conclusions it may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. Neither the City of New York nor the Commissioner guarantees that materials other than those disclosed by the geotechnical report will not be encountered, or that proportions and character of the various materials will not vary from those indicated in the available geotechnical reports or boring logs.
- C. Data on indicated subsurface conditions is not intended as a representation or warranty of continuity of such conditions. It is expressly understood that neither the City of New York nor the Commissioner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.

- D. If the Contractor finds that the available investigations and reports are not sufficient to determine the nature of the work, the Contractor may undertake its own investigations before or after submission of its bid at its own expense.
- E. Available Geotechnical Reports

Title	By	For
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

- F. Prior to bidding this project, the Contractor shall thoroughly explore the underwater conditions at the site to be fully informed about the piles left in the ground after demolition of the previous pier in the area where the fender piles will be driven. Bidders are invited to perform underwater explorations of the site to acquaint themselves with these conditions at no additional cost to the City of New York. No additional compensation will be made after award of contract for any claim related to the pile remnants in the ground. The Contractor is also encouraged to review the Geotechnical Investigation Report, which may be obtained from the City of New York in accordance with Section 01120.
- G. Protect structures, underground utilities, and other construction as necessary from damage caused by pile driving operations.

## PART 2 PRODUCTS

### 2.01 H-PILES

- A. H-piles shall conform to ASTM A572 Grade 50. Out-of-straightness shall not exceed 0.125" per 10'-0" of pile length.
- B. Piles shall be prepared and coated in accordance with Section 09967 – Coatings for Steel Waterfront Structures.
- C. Pile driving shoes may be provided at the option of the Contractor. Shoes shall be heat-treated cast steel, conforming to ASTM A27 90/60. The Contractor shall be solely responsible for the sufficiency of such shoes.
- D. Welding electrodes for pile splices shall be E70XX minimum. Welding electrodes for driving shoe to pile welds shall be at low hydrogen E90XX.

### 2.02 APPURTENANT METAL MATERIALS

- A. Metal plates, shapes, bolts, nuts, rivets, welded studs, and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and

to the requirements specified in Sections 05120 – Structural Steel and Section 05500 – Metal Fabrications, as applicable.

## 2.03 SOURCE QUALITY CONTROL

- A. Requirements for material tests, workmanship and other measures for quality assurance shall be as specified in Section 05120 – Structural Steel.
- B. Piling shall be tested and certified by the manufacturer to meet the specified chemical, mechanical, and section property requirements prior to delivery to the site. Testing of piling for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of piling shall meet the requirements of ASTM A6. The Contractor shall submit mill test reports showing numerical values of chemical and mechanical properties of piling and structural steel, in accordance with the applicable material specifications.

## 2.04 FABRICATION

- A. Shop fabricate and deliver to the site steel piles for the required installation length, to minimize field welding. All shop fabricated steel piles shall be spliced using fabrication rolls and dog guides so that misalignment will not exceed 1 inch in any direction relative to a straight line connecting the ends of a pile.
- B. Where steel piles are to be driven to rock, the Contractor shall probe each pile location to determine rock elevation prior to fabricating piles. The length of each pile shall be determined based on these measurements. The Contractor shall provide identification markings on each pile as necessary to assure that each pile is installed in its designated location to the prescribed depth.
- C. Blast preparation and coating system and application shall comply with the applicable requirements of Section 09967 - Coatings for Steel Waterfront Structures.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Verify site conditions prior to installation of fender piles.
- B. Submit for approval proposed installation procedures and equipment to be used. Both vibratory and impact hammers may be used for driving of fender piles. Rated energy for impact hammer shall be at the discretion of the Contractor.
- C. Use driving procedures which will not cause damage to nearby structures.
- D. Mark each pile's length with a horizontal line at 5-foot intervals starting from 10 feet from the pile tip.

## 3.02 FIELD TOUCH-UP OF PILE COATING

- A. Provide a compatible touch-up system for repair of coating defects, in accordance with the coating manufacturer's recommendations and as approved by the Commissioner.
- B. Perform all touch-up work and coating materials in accordance with the provisions of Section 09967 - Coatings for Steel Waterfront Structures.
- C. Before and after driving, touch up all abraded surfaces in the coating and clean and touch up all field welds in accordance with the coating manufacturer's recommendations and as approved by the Commissioner.

## 3.03 INSTALLATION OF PILES

- A. Drive all piles with a positioning template. Deliver hammer blows to central axis of pile. Do not damage piles during driving operations.
- B. In developing proposed pile installation procedures and selecting equipment, the Contractor shall consider and be prepared to respond to local conditions. It shall be the responsibility of the Contractor to select methods and equipment which will result in satisfactory installation of the piles.
- C. All steel fender piles shall be driven to minimum tip elevations indicated on the Contract Drawings or bedrock.
- D. Jetting, pre-drilling or pre-augering is not permitted unless approved by the Commissioner.
- E. Re-drive piles, which have lifted or moved due to driving adjacent piles, or by soil heave.
- F. Cut off the pile in accordance with the Contract Drawings. Cut holes in pilings for bolts, rods, drains or utilities as shown or as directed. Perform all cutting in a neat and workmanlike manner. Use a straight edge in cuts made by burning to avoid abrupt nicks. Drill or burn and ream bolt holes in steel piling by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted. Do not use explosives for cutting.
- G. Placement Tolerances
  - 1. Out-of-place and out-of-plumb measurements shall be made and reported to the Commissioner for each pile.
  - 2. Maximum out-of-place deviation, measured in any direction from centerline of pile at the cut-off elevation shall be 2 inches. Piles within these tolerances

shall be pulled into position. Piles outside of these tolerances shall be withdrawn and redriven at no additional cost to the City of New York.

3. Maximum out-of-plumb deviation measured in any direction shall be 2%.
4. Maximum deviation from theoretical cut-off elevation: 1/2 inch
- H. Driving of piles shall not take place within 100 feet of concrete placed within 7 days unless otherwise approved by the Commissioner.
- I. Splicing of piles is permitted at no additional cost to the City of New York as required for installation. Splices shall develop the full strength of the pile section.
- J. Pile splices, cut-offs and other regions of coating damage shall be recoated in a manner similar to that specified for the pile.

#### 3.04 PILE OBSTRUCTIONS

- A. Boring logs for boreholes previously drilled at the project site indicate the presence of boulders and obstructions, such as pile remnants and construction debris. If such obstructions are encountered, and piles reach premature refusal during pile driving, the Contractor shall notify the Commissioner immediately.
- B. The Contractor shall probe to locate the extent of the obstruction and propose a method of passing or removing the obstruction, including the use of a chisel beam, spud, by drilling or by other suitable means.
- C. If the Contractor demonstrates, to the satisfaction of the Commissioner, after diligently attempting to remove or penetrate through an obstruction for a minimum period of four hours, that removal or penetration of the obstruction is deemed to be impractical using appropriate methods, tools and equipment, the Contractor will be requested to stop pile driving operations and await further instructions from the Commissioner. The costs incurred by the Contractor to attempt to remove or penetrate obstructions for the prescribed minimum duration, whether or not the efforts are successful, shall be included in the lump sum price bid and no separate payment will be made therefore.
- D. If the Commissioner declares the obstruction to be an unavoidable field condition, the Contractor will be directed to remove the partially installed pile and make changes in the design or alignment of the piling structure as required by the Commissioner to insure the adequacy and stability of the structure.
- E. Payment for additional labor and materials necessitated by changes in the design or alignment of the piling structure will be made by Change Order in accordance with the General Requirements.

### 3.05 WELDING

- A. All welding shall conform to the requirements of the AWS D1.1. The Contractor shall submit for approval details of groove preparation and welding procedures. Acceptable welding processes are: FCAW, GMAW, SMAW and SAW. Out-of-straightness of welded pile shall not exceed 0.25" per 10'-0" of pile length. Splices shall be coated as specified for piles.
- B. Field splices of piles are not permitted.
- C. If welding procedure is interrupted once started, preheat temperatures shall be reestablished prior to restarting of welding.
- D. Furnish the services of AWS-certified welding inspectors to visually inspect and verify all welding.

### 3.06 UNACCEPTABLE PILES

- A. Unacceptable piles are defined as piles that fail penetration requirements are placed or cut off in positions beyond specified tolerances, or are damaged.
- B. Replace unacceptable piles with piles that conform to specified requirements.
- C. Adding piles lieu of replacing unacceptable piles is generally not an acceptable solution due to the modular layout of fender piles in relation to the entire fender system. Such an alternative would require reframing of the fender system. The Contractor may propose this solution for approval by the Commissioner for each individual location of use. All costs for design, analysis and construction of such alternative designs shall be at the expense of the Contractor.

### 3.07 FIELD QUALITY CONTROL

- A. Inspection of Driven Piling: The Contractor's registered Professional Engineer shall perform continuous inspection during pile driving and certify piles are installed in accordance with requirements herein. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Commissioner.
  - 1. The driving of each pile shall be performed in the presence of the Commissioner unless otherwise directed.
  - 2. Field inspection may be also be performed by the Commissioner's representative. The Contractor shall assist and provide access to the work area for field inspection by the Commissioner's representative.
  - 3. When inspections result in pile rejection by the Commissioner, the Contractor shall promptly segregate and remove rejected pile from the premises.

B. Installation Records: Maintain a pile driving record for each pile. These records shall be compiled and attested to by the Contractor's registered Professional Engineer. Driving records shall include:

1. Project name and number
2. Name of Contractor and Installer
3. Pile size and dimensions
4. Elevation of point, elevation of butt before and after cut-off
5. Continuous record of number of blows for each foot of penetration and final driving resistance in blows for final 6 inches
6. Installation dates and times
7. Driving equipment used including type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used
8. Pile number and locations, tip elevations, ground elevations, cut-off elevations
9. Length of driven pile from final tip elevation to cut-off elevation.
10. Any reheading or cutting of piles.
11. Alignment and plumbness checks
12. Locations and depths where difficulty in driving was encountered
13. Any unusual pile driving problems.

-END OF SECTION-

**Section 02396  
MARINE FENDERING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install all fender work to the limits as shown on the Contract Drawings, as specified herein, or as directed by the Commissioner to provide a fully operational fender system. Work includes, but shall not be limited to, steel framing, timber framing, elastomeric fender units, connections to piling, and connection to pier or wharf.
- B. Fender system shall be installed as indicated on the Contract Drawings and in accordance with the elastomeric fender unit manufacturers' guidelines.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02390 - Fender Piles
- B. Section 02398 - Marine Timberwork
- C. Section 05120 - Structural Steel
- D. Section 09967 - Coatings for Steel Waterfront Structures

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

- 1. American Society for Testing and Materials (ASTM):

- a. ASTM A123, Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
- b. ASTM A153, Zinc Coatings (Hot Dip) on Iron and Steel Hardware
- c. ASTM A193, Alloy Steel and Stainless Steel Bolting Materials for High Temperature
- d. ASTM A194, Carbon and Alloy Steel Nuts for High Pressure and High Temperature
- e. ASTM A307, Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- f. ASTM A325, Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength



- g. ASTM A391, Grade 80 Alloy Steel Chain.
- h. ASTM A563, Carbon and Alloy Steel Nuts
- i. ASTM A572, High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- j. ASTM A952, Forged Grade 80 and Grade 100 Steel Lifting Components and Welded Attachment Links
- k. ASTM A992, Structural Steel Shapes.
- l. ASTM D395, Rubber Property – Compression Set.
- m. ASTM D412, Vulcanized Rubber and Thermoplastic Elastomers – Tension.
- n. ASTM D429, Test Methods for Rubber Property—Adhesion to Rigid Substrates.
- o. ASTM D471, Rubber Property-Effect of Liquids.
- p. ASTM D 573, Rubber – Deterioration in an Air Oven
- q. ASTM D624, Tear Strength Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- r. ASTM D1149, Rubber Deterioration - Surface Ozone Cracking in a Chamber.
- s. ASTM D 1171, Rubber Deterioration – Surface Ozone Cracking Outdoors or Chamber (Tri-angular Specimens)
- t. ASTM D2000, Rubber Products in Automotive Applications.
- u. ASTM D 2137, Rubber Property – Brittleness Point of Flexible Polymers and Coated Fabrics
- v. ASTM D2240, Rubber Property – Durometer Hardness.
- w. ASTM F436, Hardened Steel Washers
- x. ASTM F2192, Determining and Reporting the Berthing Energy and Reaction of Marine Fenders.

- y. ASTM F 2329, Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
- 2. American Welding Society (AWS):
  - a. AWS D1.1, Structural Welding Code – Steel.
- 3. Permanent International Association of Navigation Congresses (PIANC)
  - a. PIANC 2002, Guidelines for the Design of Fender Systems
- 4. U.S. Department of Defense (DOD)
  - a. DOD MIL-PRF-907, Anti-seize Thread Compound, High Temperature
- 5. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.

#### 1.04 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings, the following information at least 2 weeks prior to the start of work:
  - 1. For Steel Fabrication
    - a. Shop Drawings
    - b. Descriptions of proposed welding procedures for all welded joints
    - c. Welders Certificates for welders employed on the Work, verifying AWS qualification within the previous 12 months
    - d. Certificates of Compliance: For each type of steel, bolt, welding rod and electrode, or other product furnished, submit the manufacturer's or supplier's certifications, that the products meet the specified requirements.
  - 2. For Elastomeric Fenders
    - a. Manufacturer's Qualifications: Submit evidence of qualifications including a list of similar projects manufacturer has supplied, along with the Owner's contact persons for those projects demonstrating experience meeting the requirements of Article 1.06.

- b. Product data on fender units and accessories, including rated performance data and published performance curves in accordance with PIANC 2002 Appendix A.
  - c. Manufacturer's Test Reports in accordance with requirements of Paragraphs 1.06F, 2.03B.4 and 2.03C. Submit either a "Type Approval" certificate per PIANC 2002 or documentation of past fender testing which was performed subject to inspection and witnessing by an accredited third party agency certifying that fender performance and physical property tests conform to this Specification.
    - (1) Submit certified test reports on production units demonstrating compliance with Article 2.03. Include all testing specified in Appendix A of PIANC 2002. Testing shall be performed by the Engineer approved testing laboratory and signed and sealed by a professional engineer licensed in any State.
    - (2) For fenders with a PIANC 2002 "Type Approval" and/or fenders produced by manufacturers listed in Article 2.03.B.2, "Acceptable Manufacturers", in lieu of tests on production units, manufacturer may submit test reports performed within three years of submittal and accompanied by notarized certificates from the manufacturer certifying that the tested material is of the same type, quality, manufacture and make as that proposed to be supplied.
  - d. Shop Drawings showing details of fender impact panel, chains and accessories.
  - e. Shop Drawings showing modifications required to pier or wharf detailing shown on the Contract Drawings for compatibility with fender unit selected.
  - f. Analysis of anchor bolt groups, using proposed bolts and considering interaction among bolts and their proximity to free edges of concrete, demonstrating adequacy of bolt groups to safely sustain design loads indicated. See also requirements of Paragraph 2.01D.1.
  - g. Manufacturer's Warranty: Furnish the manufacturers warranty. The warranty shall be issued directly to the City of New York and shall not be limited in dollar value. The warranty period shall not be less than 10 years from the date of issue of Final Completion.
3. For Timber: Provide certificates for timber, preservative treatment, and galvanized hardware.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Handle lumber and timber in conformance with Section 02398 - Marine Timberwork.
- B. Fender system elements shall be shipped, handled, and stored without distortion or damage. Deliver fenders undamaged and handle and store to prevent damage, such as bending or abrading end fittings, cutting of rubber, or damage to coating of hardware. Protect fenders from exposure to damaging liquids, oils, greases and extended exposure to sunlight. Store in a clean, properly drained location off the ground.
  - 1. Rejection: Fenders delivered to the site in a damaged condition or that are not in conformance with this specification are subject to rejection. Replace any rejected materials to the satisfaction of the Commissioner at the no expense to the City of New York.

**1.06 QUALITY ASSURANCE**

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Welding of structural steel shall be subject to controlled inspection in accordance with the requirements of the New York City Building Code and the provisions of the General Conditions. Controlled inspection and testing services required by the New York City Building Code will be provided by the Commissioner. The Contractor shall cooperate with the Commissioner in the performance of its duties for controlled inspection. Failure of a controlled inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- C. Testing and Inspection: Material and fabrication procedures are subject to inspection and tests in the mill, shop and field under the direction of the Commissioner. Such inspection and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- D. Install elastomeric fender units in accordance with recommendations of the manufacturer.

- E. The elastomeric fender units and their accessories shall be manufactured by a company regularly engaged in the manufacture and production of fenders similar in material, design, and extent to that indicated for this Project, with at least 3 years of successful documented experience producing fender units of the type to be used on this project.
  - 1. The manufacturer must have produced fender units, of the type(s) specified.
  - 2. The Fender Manufacturer shall apply a system of Quality Management which conforms to ISO 9000/9001 or a recognized equivalent. This system must be certified by an acknowledged and accredited organization, and proof of adherence to this system must be submitted.
  - 3. A list of at least [3] similar fender installations shall be submitted to the Engineer.
- F. Manufacturer Performance Testing for Fenders: All manufacturer's testing shall be performed using full size fenders in accordance with ASTM F2192 and as specified herein:
  - 1. All fender units shall be given a unique serial number which can be traced to manufacturing and testing records.
  - 2. Fenders shall be tested under direct (vertical) compression.
  - 3. Compression speed shall be 2-8 cm/min.
  - 4. Test temperature shall be 23° C  $\pm$ 5°C. Where the ambient temperature is outside this range, fenders shall be normalized to this temperature range in a conditioning room for an appropriate period dependent upon fender size, or performance values may be corrected according to temperature correction factor tables.
- G. Conform to all applicable codes for design, fabrication, and erection of structural steel framing.

## PART 2 MATERIALS

### 2.01 STEEL FRAMED IMPACT PANEL

- A. Conform to the provisions of Section 05120 - Structural Steel unless otherwise indicated herein.
- B. Unless otherwise noted on the Contract Drawings, structural steel shall conform to ASTM A572, Grade 50, or ASTM A992. All exposed surfaces of steel framing shall be coated in accordance with Section 09967 - Coatings for Steel Waterfront Structures.

- C. High strength bolted connections: Bolts - ASTM A325; nuts - ASTM A563 Grade DH; washers ASTM F436. Bolts, nuts and washers shall be galvanized in accordance with ASTM F2329.
- D. Anchor Bolts, Nuts, Washers: ASTM A193 Grade B7; nuts ASTM A563 Grade DH and compatible steel washers conforming to ASTM F436, all galvanized in conformance with ASTM F2329.
  - 1. Fender Anchors/Concrete Embedments: Concrete embedments (anchor bolt inserts) shall be no closer than 10 inches to an edge of the supporting concrete element, and designed to resist a pullout, assuming 4,500 psi concrete, 1.25 times greater than the breaking strength of the attached steel rods.
- E. Anti-seize Compound: DOD MIL-PRF-907.
- F. Welding Of Structural Steel
  - 1. General: Conform to the more stringent of the requirements herein or as specified in Section 05120 – Structural Steel.
  - 2. All welding shall conform to the requirements of the AWS D1.1.
  - 3. All groove welds shall be complete penetration welds unless otherwise shown on the Contract Drawings.
  - 4. All welds shall be AWS pre-qualified welds and approved for execution by the Commissioner.
  - 5. If welding procedure is interrupted once started, preheat temperatures shall be reestablished prior to restarting of welding.
  - 6. The Commissioner will provide the services of AWS certified welding inspectors to visually inspect and verify all field welding and to conduct NDT welding inspections.
  - 7. All welded connections shall be seal welded in addition to the required structural welds indicated.
  - 8. Minimum fillet weld size shall be 3/16 inch unless otherwise indicated.
  - 9. Filler metal shall conform to the following:
    - a. Electrodes for manual metal-arc welding shall conform to the requirements of AWS D1.1, classification E70XX welding electrodes.
    - b. The bare electrodes and flux used in combination for submerged arc welding shall conform to the requirements of the AWS Code.

- G. The impact panels shall be delivered fully coated in accordance with Section 09967, "Coating of Steel Waterfront Structures". Coating materials shall be provided for recoating the areas affected by the field connections and areas damaged in shipment, storage and installation.

## 2.02 TIMBER FRAMING AND FACING

- A. Timber Materials: Conform to Section 02398 - Marine Timberwork. Cap plate shall be composed of steel conforming to ASTM A572 Grade 50, galvanized in conformance with ASTM A123.

## 2.03 ELASTOMERIC FENDER UNITS

- A. Performance criteria for maximum reaction and minimum impact energy at each unit shall be as indicated on the Contract Drawings.
- B. Fender element rubber shall be natural or synthetic conforming to ASTM D2000 with defined characteristics equal to that in the following:
  - 1. Provide PIANC "Type Approval" Fenders or fenders tested in accordance with PIANC 2002, Appendix A, "Procedure to Determine and Report the Performance of Marine Fenders".
  - 2. Acceptable Manufacturers
    - a. FenderTeam Americas Inc., 44084 Riverside Parkway Suite 170, Lansdowne, VA 20176, Tel. (571) 281-3770, [www.fenderteam.com](http://www.fenderteam.com)
    - b. Trelleborg, Virginia Harbour Services Inc., P.O. Box 98, Clearbrook, VA 22624, Tel. (540) 667 5191, [www.trelleborg.com/marine](http://www.trelleborg.com/marine)
    - c. Quay-Quip Pem, 9517 Laa La Way, Diamondhead, MS 39525 (337) 501-2201 <http://www.quayquip-pem.com>
  - 3. "V" type fender units shall be Trelleborg AN/ANP units of the size and rubber grade indicated on the Contract Drawings or approved equal, conforming to the requirements herein.
  - 4. The rubber fender units shall be molded rubber with encapsulated/bonded steel plates to provide adequate strength for connection to the dock structure and fender panel and for the operation of the fender system. Plates shall be fully encased in rubber to a minimum thickness of 1/16 inch. The rubber fender shall be of vulcanized natural or synthetic rubber or a mixture thereof, which is compounded to provide satisfactory resistance to aging, seawater, fatigue and abrasion. These shall be reinforced with carbon black and resistant to aging, seawater, abrasion, and ultraviolet rays. The rubber shall be homogenous in quality and free from foreign materials, bubbles, injuries,

cracks and other harmful defects that could be detrimental to the usefulness or performance of the fender. The embedded fixing steel plates shall be firmly bonded into the rubber body through the process of vulcanization, and completely encapsulated so that no steel is exposed. The rubber material from which the fender unit is molded shall meet the following requirements:

Test Item & Sampling Frequency	Property Tested	Test Method	Requirements
Rubber Material (1 set from each lot of manufacture of the supplied fenders)	Tensile Strength (before aging)	ASTM D 412 Die C	2,300 psi min.
	Tensile Strength (after aging)	ASTM D 573 (96 hrs @158±2°F)	Not less than 80% of before aging
	Ultimate Elongation (before aging)	ASTM D 412 Die C	300% min.
	Ultimate Elongation (after aging)	ASTM D 573 (96 hrs @158±2°F)	Not less than 80% of original value
	Hardness (before aging)	ASTM D 2240, Shore A	75±5° max
	Hardness (after aging)	ASTM D 573 (96 hrs @158±2°F)	Original +10° max
	Ozone Resistance	ASTM D1171, Method A, 38°C, 72hrs exposure	No Visible Cracking
	Tear Resistance	ASTM D 624, Die B	4,800 lbs/ft Min.
	Low Temperature Resistance	ASTM D 2137, Method A, 9.3.2 non-brittle after 3 min. @ -40°F	pass
Durability (10% of fenders)	Durability	PIANC 2002 Appendix A	No cracks or defects visible to naked eye after 3,000 cycles

C. Fender Marking: Unless otherwise specified or indicated, provide identification markings or tags in readable characters at least 1 inch high, either directly on units or on corrosion- and sunlight-resistant permanently attached tags. The markings shall include the following:

1. full or abbreviated manufacturer name,
2. fender size model or part number designation,
3. fender serial number, and
4. rated performance (energy and reaction).



D. Color: Black throughout the entire thickness.

E. Source Quality Assurance

1. Maintain an inspection and record system to verify that all materials, workmanship and completed work conform to the specified requirements. The specimens for testing and inspection of the materials, dimensions, and performance shall be sampled as specified below. The specimens to be used for the material tests shall be taken directly from the products or from the rubber prepared in the same lot, under the same conditions and in the same vulcanization process as the products.

Test Item	Number of Sampling
Rubber Material	See table above
Dimensions	All fenders
Performance	10% of fenders

F. Manufacturer/ Installation Tolerances

1. For all molded fender elements all dimensions shall be within  $\pm 3\%$  or  $\pm 0.25$ -inch of the specified lengths, and all bolt hole spacing shall be within  $\pm 0.08$ -inch of the specified distances as shown on the Contract Drawings.
2. All molded fender elements shall have reaction, energy and deflection performances within  $\pm 10\%$  of the theoretical design performance ratings.
3. All individual units installed shall be plumbed, leveled and aligned to within 1 inch of the dimensions as specified on the Contract Drawings.
4. Tolerances shall not be cumulative.

## 2.04 ACCESSORIES

- A. Chains shall be alloy Grade 80 chains conforming to ASTM A391, with accessories of matching or greater strength conforming to ASTM A952 or other approved standard. Chain assemblies shall have minimum safe working load capacities, proof test loads and breaking forces as indicated on the Contract Drawings. Tensioner shaft shall conform to ASTM A193 Grade B7; plate components of tensioner assembly shall conform to A572 Grade 50. Chains, chain connection fixtures and tensioner assembly components shall be hot dipped galvanized in accordance with ASTM A123, ASTM A153 or ASTM F2329 as applicable, with a minimum of 4 mils thickness of zinc coating.
- B. Where shown on the drawing, bolts used in fender attachment shall be ASTM A307, with matching nuts conforming to ASTM A563 Grade A, heavy hex, and

washers conforming to ASTM F436, all galvanized in conformance with ASTM F2329.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Before commencing work, examine the condition of all existing structural elements and other work on which this work is in any way dependent for its sufficiency according to the intent of these specifications. No claims of "Waiver of Responsibility" for such defective structural elements and other work will be considered unless filed in writing and acceded to in writing before the work is begun.

#### 3.02 FIELD INSTALLATION OF STEEL FRAMED IMPACT PANELS

- A. Impact panels shall be set at elevations indicated. Connections between the piles and impact panels shall be welded or bolted as indicated. Install and connect components in accordance with the requirements of Section 05120 – Structural Steel.
- B. Impact panels shall be stabilized by chain connections to the pier or wharf structure.
- C. Unless otherwise shown on the Contract Drawings, chain anchorages in concrete shall be placed by drilling holes for anchor bolts equal to diameter of the bolt plus 1/8" and bolt set in epoxy grout. Length and size of the anchor bolts shall be at least of the dimensions indicated unless larger sizes are determined in accordance with force analysis performed by the fender manufacturer, and approved by the Commissioner.
- D. Connections: Coat threads of bolts with anti-seize compound prior to installing washers and nuts. Recoat bolt thread projection beyond nut after tightening.
- E. Field Touch-Up
  - 1. For Epoxy Coated Assemblies: After assembly or erection, clean, prime and coat the field bolt heads and nuts, field welds, and any abrasions in the shop coat with paint of the same quality and dry film thickness as that used for the shop coat in accordance with the provisions of Section 09967, "Coatings for Steel Waterfront Structures".
  - 2. For Galvanized Assemblies: If galvanized steel surfaces are damaged by handling, transporting, cutting, welding, or bolting, repair surfaces in accordance using galvanized repair paint in accordance with provisions of Section 05120, "Structural Steel". Do not heat surfaces to which repair paint has been applied

### 3.03 FIELD INSTALLATION OF ELASTOMERIC FENDERS

#### A. Condition of Surfaces

1. Prior to commencing with the erection and/or installation of fender units of this Section, inspect the job site and verify that the fender units can be erected in accordance with the Contract Drawings and Specifications.
2. Obtain field measurements required for proper and adequate installation of the work covered in this Section. Assume responsibility for exact measurements.
3. Furnish templates, if required, for exact locations of items to be embedded in concrete and any setting instructions required for installation.
4. Check the alignment and elevation of all anchor bolts and other installation conditions with transit and level instruments before starting erection / installation of units.
5. Discrepancies
  - a. In the event of discrepancy, immediately notify the Commissioner.
  - b. Construction shall not commence in regions of discrepancy until the discrepancy or discrepancies have been resolved.

#### B. Install fender units as indicated on approved Shop Drawings and in accordance with manufacturer's instructions.

1. Care shall be taken to protect work already installed from damages resulting from docking fender system installation.
2. Set assemblies and members to the lines and elevations indicated. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
3. Remove any oil, grease or other substances harmful to the fender units after installation.
4. All touch-up concrete work shall be performed in accordance with the provisions of Section 03300 - Cast-in-Place Concrete.

### 3.04 FIELD INSTALLATION OF PILES AND TIMBER FRAMING

#### A. Installation of steel fender piles shall conform to Section 02390 - Fender Piles.

- B. Construction and field treatment of timber framing and facing shall conform to Section 02398 - Marine Timberwork.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 02398**  
**MARINE TIMBERWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install timber facing boards and blocking for timber pile dolphin, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. This Section includes, but is not limited to, the following items:
  - 1. Lumber and Timber
  - 2. Hardware
  - 3. Galvanizing Repair Paint
  - 4. Field Treatment

**1.02 RELATED SPECIFICATIONS**

- A. Section 02464 – Marine Timber Piles
- B. Section 02396 – Marine Fendering

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
    - a. ANSI/ASME B18.2.1, Square and Hex Bolts and Screws (inch series).
  - 2. American Society for Testing and Materials (ASTM)
    - a. ASTM A123, Zinc (Hot-Galvanized) Coatings on Product Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.
    - b. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - c. ASTM A307, Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
    - d. ASTM A563, Carbon and Alloy Steel Nuts.

- e. ASTM D 5893, Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
  - f. ASTM F 2329, Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
- 3. American Wood Preservers Association (AWPA)
  - a. AWP M4, Care of Preservative - Treated Wood Products.
  - b. AWP M6, Brands Used on Forest Products
  - c. AWP P5, Water Borne Preservatives.
  - d. AWP U1, Use Category System: User Specification for Treated Wood
- 4. American Lumber Standards Committee (ALSC)
  - a. ALSC, Softwood Lumber Standards.
- 5. Western Wood Preservers Institute (WWPI)
  - a. WWPI BMP, Best Management Practices for the Use of Treated Wood in Aquatic Environments - Joint Publication with Canadian Institute of Treated Wood.
- 6. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
- 7. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.
- 8. U.S. Department of Defense (DOD)
  - a. MIL-P-21035, Paint, High Zinc Dust Content, Galvanizing Repair (Metric).

#### 1.04 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  - 1. Certificates: Provide certificates for timber, preservative treatment, and galvanized hardware. Identify materials, sizes, treatment, and sources. Submit certification with inspection report of an independent inspection agency that preservative treatment of timber for this Project complies with this specification as a minimum and applicable AWP and WWPI BMP's

standards in accordance with Article "Quality Assurance" herein. Submit example of identifying mark that will be exhibited on each timber as specified in Paragraph 1.05B.2 herein.

2. Materials and Safety Data Sheets (MSDS) and Consumer Information Sheets (CIS) for Treated Timber: Submit MSDS and CIS associated with timber preservative treatment. The Contractor shall comply with all safety precautions indicated on MSDS and CIS.

#### 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Timber Preservative Treatment:
  1. The Contractor shall be responsible for the quality of treated wood products.
  2. Identify treatment on each piece by the quality mark of an agency accredited by the Board of Review of the ALSC.
  3. Inspect all preservative treated wood visually to ensure there are no excessive residual materials or preservative deposits. Unless treated piles have aged at least six (6) months prior to installation, treatment shall conform to WWPI BMP to avoid leaching of preservative chemicals into the waterway.
  4. The Contractor shall submit inspection report(s) of an independent inspection agency, approved by the Commissioner that offered products (each timber) comply with applicable AWPAs standards and WWPI BMP's. Materials shall be clean and dry or the report(s) will be rejected because of environmental concerns.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber and timber off the ground on skids and under cover in a manner that prevents warping and allows shedding of water. Handle timber with rope or chain slings without dropping, breaking outer fibers, bruising, or penetrating the surface with tools. Do not use cant dogs, peaveys, hooks, or pike poles. Protect timber and hardware from damage.



## PART 2 PRODUCTS

## 2.01 LUMBER AND TIMBER

- A. Timber Facing for Fender Panels: Demerara Greenheart timbers having the following characteristics:

1. Modulus of elasticity	3,100,000 psi
2. Bending working stress	3,300 psi
3. Compression parallel to grain working stress	3,000 psi
4. Shear parallel to grain working stress	400 psi

- B. Blocking for timber pile cluster: Solid-sawn Dense Structural stress-rated Southern Pine or Douglas Fir-Larch (No. 2) with minimum  $f_b = 1750$  psi. Lumber shall be grade marked by and identified by the grade mark of a recognized association or independent inspection agency using the specific grading requirements of an association recognized as covering the species used. The association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Preservative treatment shall be waterborne preservative conforming to AWWA Specification P5. Treatment shall conform to AWWA U1, Use Category UC5A Marine Use Northern Waters, with waterborne preservatives. Each piece of treated lumber or timber shall be branded by the producer in accordance with AWWA M6 that identifies the treatment by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee.

## 2.02 HARDWARE AND ACCESSORIES

- A. Hot dip galvanize all steel items according to ASTM F 2329 for bolts, nuts, screws and washers, and ASTM A123 or A153 as applicable for other materials with a minimum of 4 mils of zinc coating. Provide bolts with nuts and washers as indicated. Bolts shall be ASTM A307, Grade A with ASTM A563 nuts. Bolt heads and nuts shall be square. Lag screws and bolts shall be ANSI/ASME B18.2.1. Washers shall be plate or cut washers as indicated. Provide bolts with washers under nut and head.
- B. Galvanizing Repair Paint: High zinc-dust/zinc oxide content paint conforming to MIL-P-21035 for repair of damaged galvanized surfaces. Compound paint with a suitable vehicle in a ratio of one part zinc oxide to four parts zinc dust by weight.
- C. Silicone Sealant
1. One-part silicone formulation ASTM D 5893, Type NS except use Type SL for horizontal applications. Acetic acid cure sealants will not be permitted.

## 2. Acceptable Products – Type SL, Self Leveling

- a. Crafcro Roadsaver Silicone SL by Crafcro Inc., Chandler (Phoenix), AZ
- b. CSL 315 by CSL Silicones, Guelph, Ontario
- c. Dow Corning 890SL by Dow Corning Corp., Midland, MI
- d. Pecora 300SL by Pecora Corporation, Harleyville, PA
- e. Spectrem 900SL by Tremco Incorporated, Beachwood, OH
- f. Or approved equal

## 3. Acceptable Products – Type NS, Non-Sag

- a. Crafcro Roadsaver Silicone by Crafcro Inc., Chandler (Phoenix), AZ
- b. CSL 342 by CSL Silicones, Guelph, Ontario
- c. Dow Corning 888 by Dow Corning Corp., Midland, MI
- d. Flexseal 310 by Roadseal Technology, Inc., Tucson, AZ
- e. Pecora 301 NS by Pecora Corporation, Harleyville, PA
- f. Spectrem 800 by Tremco Incorporated, Beachwood, OH
- g. Or approved equal

## PART 3 EXECUTION

## 3.01 CONSTRUCTION

- A. Cutting and Boring: Cut timber so joints fit over contact surfaces. Bore holes for bolts with a bit 1/16-inch larger in diameter than the rod or bolt. Bore hole for lag screws in two parts. Make lead hole for the shank the same diameter as the shank. Make lead hole for the threaded portion equal to 2/3 of the shank diameter. Counter-bore for countersinking where smooth faces are shown on the Contract Drawings or as specified.
- B. Fastening: Use washers under all bolt heads and nuts in contact with wood. Burr threads of all bolts after nuts have been finally tightened. Where bolts are used to fasten timber to timber or timber to steel, bolt members together when they are installed and re-tighten immediately before final acceptance of the contract. Bolts shall have additional threading to provide at least 3/8-inch per foot thickness of timber for future re-tightening. Minimum bolt size shall be 3/4 inch. .

## 3.02 FIELD TREATMENT

- A. Lumber and Timber: Field treat cuts, bevels, notches, refacings, and abrasions according to AWP A M4. Trim cuts and abrasions before treating. Paint depressions and openings around bolt holes, joints, and gaps, including recesses formed by counterboring, with the same preservative used in the pressure treatment. After bolt or screw is in place, fill depression with silicone sealant.
- B. Galvanized Surfaces: Repair and recoat galvanized coating which has been field or shop cut, burned by welding, abraded, or otherwise damaged to the point that the

base metal is exposed. Thoroughly clean the damaged area by wire brushing and remove all traces of welding flux and loose or cracked galvanized coating before painting. Paint cleaned area with two coats of galvanizing repair paint for a minimum 2.0 mil dry coating thickness.

-END OF SECTION-

**Section 02456**  
**PILE LOAD TESTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of pile load testing of selected test piles to determine the allowable axial compression and lateral pile load capacities of production foundation steel pipe or composite tapered piles with documented results.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02364 - Steel Pipe Piles
- B. Section 02365 - Composite Tapered Piles
- C. Section 02371 - Dust, Soil Erosion and Sedimentation Control

**1.03 MEASUREMENT AND PAYMENT**

**A. Measurement**

- 1. The number of pile load tests measured for payment will be the actual number of completed and accepted pile load tests performed as directed by the Commissioner to determine the allowable axial compression or lateral pile load capacity of selected test piles.
- 2. Units of measurement for pile load tests shall be as follows:
  - a. Compression Pile Load Tests - Steel Pipe Piles or Composite Tapered Pile, 20-inch Diameter: per each
  - b. Compression Pile Load Tests - Steel Pipe Piles, 36-inch Diameter: per each
  - c. Lateral Pile Load Test - Steel Pipe Pile or Composite Tapered Pile, 20-inch Diameter: per each
  - d. Lateral Pile Load Test - Steel Pipe Pile, 36-inch Diameter: per each

**B. Payment**

- 1. Compression Pile Load Test: The contract unit price shall include the cost of all labor, materials and equipment associated with the setup and dismantling of the load test frame and jacks, test procedure, monitoring, documentation, and submittal of test method and results for each test.

2. Lateral Pile Load Test: The contract unit price shall include the cost of all labor, materials and equipment associated with the setup and dismantling of the load test frame and jacks, test procedure, monitoring, documentation, and submittal of test method and results for each test.
3. Pile load tests conforming to the specified requirements will be paid for at the unit price bid per pile load test. The unit price bid shall include the cost of furnishing all labor, materials and equipment necessary to complete the pile load test in conformance with the specified requirements.
4. Installation of test piles and reaction piles at production pile locations will not be paid for under the Contract Bid Item for Pile Load Tests but will be paid for under the Unit Price shown on the Bid Form for steel pipe piles in accordance with Section 02364 - Steel Pipe Piles, or composite tapered piles in accordance with Section 02365 - Composite Tapered Piles.
5. No separate payment will be made for costs associated with installing test piles and reaction piles at non-production pile locations. Such costs shall be included in the unit price bid for Pile Load Tests.

#### 1.04 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  1. American Society for Testing and Materials (ASTM)
    - a. D1143, Standard Test Method for Piles Under Static Axial Compression Load.
    - b. D3966, Standard Test Methods for Deep Foundations Under Lateral Loads.
  2. City of New York
    - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
    - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

## 1.05 SUBMITTALS

- A. Prepare and submit the following in accordance with the provisions of the General Conditions and Section 01330 - Shop Drawings:
  - 1. Pile Load Test Program: Submit complete details of proposed pile load test program, including qualifications of proposed subcontractor retained to perform required load tests; proposed test method, equipment, instruments, and other accessories and appurtenances required for the tests; data and calibration curves for all instruments used in the tests; and detailed working drawings showing the proposed pile load test setup and procedure describing how the tests will be performed.
  - 2. Load Test Report upon completion of test. The Report shall be signed by a licensed Professional Engineer currently registered in the State of New York. Submit Professional Engineer's qualifications regarding pile installation and load testing for review and approval.

## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Testing and Inspection
  - 1. All pile load tests shall be subject to special inspection in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the provisions of the General Conditions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
  - 2. Special Inspections
    - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.

- b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
  - c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- C. Furnish all labor, materials, equipment and incidentals required to assure adequate environmental protection including implementation of all control measures as directed by the Commissioner and specified herein.
  - D. Comply with all applicable Federal, state and local laws and regulations concerning environmental protection, restoration and erosion and sediment control.
  - E. Axial Compression Load Test: Perform work in accordance with the provisions of ASTM D1143 and the New York City Building Code, Local Law 76/2008. The more stringent criteria of which shall govern.
  - F. Lateral Load Test: Perform work in accordance with the provisions of ASTM D3966, and the New York City Building Code, Local Law 76/2008. The more stringent criteria of which shall govern.
  - G. Monitor load test procedures and record load-movement readings under direct supervision of a licensed Professional Engineer registered in the State of New York and experienced in this work.
  - H. Coordinate work of this Section with the work of other trades so that construction and production pile driving are not delayed.
  - I. Sequence work to allow other piling operations and adjacent work during load testing.

#### 1.07 PROJECT CONDITIONS

- A. Comply with the requirements of Section 02371 - Dust, Soil Erosion and Sedimentation Control.

#### PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Review available subsurface information and visit the site prior to submitting bid to determine existing site conditions, assess the site geometry, equipment access conditions, and location of existing structures and utilities.
- B. Verify that site conditions will support cribbing and imposed load for testing purposes.

### 3.02 PREPARATION

- A. Establish stable working surface for test equipment.
- B. Provide three (3) telltales in each pile. Telltales shall be installed in accordance with ASTM D1143 and positioned in a manner approved by the Commissioner to measure the deflection at the following points:
  - 1. Pile tip
  - 2. Bottom of organics layer
  - 3. Half-way between the pile tip and the bottom of organics layer
- C. Provide one test crib for each pile load test.

### 3.03 LOAD TESTING

- A. Prior to any production pile driving, a number of selected piles, as indicated on the Contract Drawings, shall be load tested to determine the allowable axial compression or the allowable lateral pile load capacity and establish pile driving criteria for production piles. Production piles shall not begin until all pile test data (compression, lateral, and dynamic, including restrikes if applicable) are submitted to and approved by the Commissioner.
- B. Notify the Commissioner at least 48 hours in advance of performing load tests. Testing shall be performed in the presence of an authorized, qualified representative of the Commissioner.
- C. For Axial Compression Load Tests: Subject each load test pile to the ultimate driven capacity load indicated on the Contract Drawings in accordance with the load and time sequencing specified in ASTM D1143 and the New York City Building Code, Local Law 76/2008, the more stringent criteria of which shall govern.
- D. For Lateral Load Tests: Subject each load test pile to two times the allowable design load indicated on the Contract Drawings in accordance with the load and



time sequencing specified in ASTM D3966 and the New York City Building Code, Local Law 76/2008, the more stringent criteria of which shall govern.

#### 3.04 FIELD QUALITY CONTROL

- A. All pile load tests will be inspected and monitored by the Special Inspector. The Special Inspector will be responsible to document equipment used, method of calibration and recording, test results, recommendations or modification of piling installation method.
- B. Cooperate with and assist the Special Inspector in the performance of its duties for special inspection.
- C. Accurately record actual dimensions and locations of tested piles and movement or distortion caused by testing.

#### 3.05 EQUIPMENT REMOVAL

- A. Dismantle the load test frame and jacks and remove test apparatus from site at completion of load tests.

-END OF SECTION-

**Section 02457  
STEEL SHEET PILES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Work of this Section includes all labor, materials, equipment and services necessary to furnish, fabricate and install a new steel sheet pile wall system, including king piles, Z piles, and connectors, in front of the existing marina wall, complete in place as shown on the Contract Drawings and/or specified herein and as required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- 1. Section 01435 – Monitoring Survey
- 2. Section 02396 – Marine Fendering
- 3. Section 05120 - Structural Steel
- 4. Section 09967 - Coating for Steel Waterfront Structures

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and the latest addenda thereto of the following standards to the extent referenced. The publications are referred to in the text by basic designation only.
  - 1. American Society for Testing and Materials (ASTM)
    - a. ASTM A6, General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
    - b. ASTM A328, Steel Sheet Piling.
    - c. ASTM A572, High-Strength, Low-Alloy Columbium-Vanadium Structural Steel
  - 2. American Welding Society (AWS)
    - a. AWS D1.1, Structural Welding Code – Steel.
  - 3. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - 4. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

#### 1.04 SUBMITTALS

A. Submit the following in accordance with the General Conditions and Section 01330  
- Shop Drawings:

1. Qualification Submittals

- a. Contractor's Engineer: Submit qualifications of the Contractor's licensed Professional Engineer registered in the State of New York demonstrating experience monitoring and certifying sheet pile installations of similar type and capacity to those of this project and in performing precondition surveys of the type specified herein. Comply with requirements of Paragraph 1.05B.
- b. Sheet Pile Installation Subcontractor: Submit a list of similar projects that the Contractor or the installation Subcontractor has completed, along with the Owner's contact persons for those projects demonstrating experience required by this Section.
- c. Contractor's Surveyor: Submit qualifications of the Contractor's Surveyor demonstrating experience in movement monitoring surveys of existing structures and in surveying sheet piles over water similar to the requirements of this Project.
- d. Contractor's Vibration Monitoring Specialist(s): Submit name and qualifications of Contractor's Vibration Monitoring Specialist(s) in conformance with Section 01435.
- e. Sheet Pile Manufacturer: Evidence of manufacturer's quality control program as specified in Paragraph 1.05E.
- f. Welders
  - (1) Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he/she has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.
  - (2) Submit certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

2. Shop Drawings

- a. Pile Identification Plan: Prior to pile driving, submit a pile identification plan showing pile locations, cut-off elevations and king and intermediate sheet pile numbering system.
- b. Sheet Pile Driving Template: Submit drawings or a detailed description of a sheet pile driving template showing conformance with provisions of Paragraph 3.04C.
- c. Steel Sheet Piles: Submit drawings for approval prior to start of the work or ordering materials. Include details of king piles, Z piles, interlock connectors, top protection, special reinforcing tips, tip protection, lagging, splices, fabricated additions to plain piles and driving, cut-off method, and corrosion protection. Drawings for sheet piling including fabricated sections shall show complete dimensions including minimum section properties, details of piling and the driving sequence and location of piling. Include details and dimensions of templates and other temporary guide structures for installing the king piles. Provide details of the method of handling king and sheet piling to prevent permanent deflection, distortion or damage to piling interlocks.
- d. Description of vibration monitoring and movement monitoring procedures.
- e. Pre-construction background vibration and condition surveys in conformance with Section 01435, with documentation as noted in Article 3.02.
- f. Description of marina wall movement monitoring procedures, equipment and reporting details.

3. Quality Control Submittals

- a. Certificates
  - (1) Pile pulling method
  - (2) Material Certificates: Submit Material Certificates for each shipment identified with specific lots prior to installing sheet piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.
- b. Sheet Pile Driving Equipment: Submit descriptions of sheet pile driving equipment to be employed in the work. Descriptive information shall include manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet and templates. Include

documentation that driving procedure proposed will not exceed vibration limits or marina wall movement limits specified herein. The documentation should include but not be limited to: chart(s) and/or graph(s) relating vibration transmission to distance from source, the specifications of the equipments that were used to generate the chart(s) or graph(s), the soil conditions if the chart(s) or graph(s) were derived from vibration test(s) and/or measurements from similar project(s). The equipment data pertinent to the chart(s) shall be consistent with that of proposed procedure and method.

4. Contract Closeout Submittals

- a. Sheet pile installation records: Submit as specified in Paragraph 3.06C.
- b. "As-built" Record Drawings showing pile locations and plumbness. The concrete facing and cap shall not be formed or placed until the as-built drawings have been approved.
- c. Vibration and movement monitoring final reports.

1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. The Contractor, in accordance with the provisions of Section 01451 - Contractor's Quality Control, shall engage the services of a licensed Professional Engineer registered in the State of New York (Contractor's Engineer) to sign and seal design calculations prepared for temporary bracing systems and perform the preconstruction condition survey. The same Engineer need not perform both of these tasks.
- C. Provide the services of an independent surveyor, licensed in the State of New York and approved by the Commissioner, to monitor marina wall movement, to perform surveys and layouts for the driving template and piles, and to determine vertical and horizontal alignments.
  1. The installed location of each pile shall be established and verified by survey.
  2. Survey information may be submitted on several drawings, each covering a partial area only, as the job progresses, to expedite the approval of the pile work. Upon completion of all pile driving, the Contractor shall submit to the Commissioner, AutoCAD drawings having the same locations of all the piles, including obstructed, damaged and compensating piles, percentage out of plumb and the cut-off elevation and length below cut-off elevation for each pile.

3. Conform to the requirements of the General Conditions.

- D. Sheet Piling Lengths: The Contractor shall propose order lengths for king and sheet piles based on subsurface information furnished. Do not order piles until the Commissioner approves order lengths.
- E. The sheet piling shall be installed by a firm having a minimum of three (3) years experience in the installation of similar type units. All installation shall be supervised by Contractor's personnel with previous satisfactory experience in the installation of at least two similar wall systems. The sheet pile supplier shall have in place a quality control program for the manufacture of the wall system components.
- F. Coordinate work of this Section with the work of other trades so that construction is not delayed.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Pile materials shall be shipped, handled, and stored without distortion or damage. Store in a clean, properly drained location off the ground.
- B. Handle sheet piling using handling holes or lifting devices. Handle long length sheet piles with care to prevent damage. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be in a vertical plane. Protect piling to prevent damage to coatings and to prevent corrosion prior to installation. Any damage to steel or coatings shall be repaired to the satisfaction of the Commissioner and at no cost to the City of New York.
- C. Configure sheet piling storage to facilitate required inspection activities.

1.07 SITE CONDITIONS

- A. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available upon written request as described in Section 01120 -Contract Summary. The Contractor may use this report to establish the quality of subsurface materials expected to be present at the project site. The Contractor may use this report to establish the quality of materials expected to be present at the project site and determine the proper length of sheet piles. The Contractor is advised that all available samples and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of the Contract, but are available for information purposes only.
- B. The Contractor is responsible for any conclusions it may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. Neither the City of New York nor the Commissioner guarantees that materials other than those disclosed by the geotechnical report will not be encountered, or that proportions and

character of the various materials will not vary from those indicated in the boring logs.

- C. Data on indicated subsurface conditions is not intended as a representation or warranty of continuity of such conditions. It is expressly understood that neither the City of New York nor the Commissioner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.
- D. If the Contractor finds that the investigations are not sufficient to determine the nature of the work, he/she can undertake his/her own investigations before or after submission of his bid at his/her own expense.
- E. Prior to bidding this project, the Contractor shall thoroughly explore the underwater conditions at the site to be fully informed about the piles left in the ground after demolition of the previous pier and in the area where the piles will be driven. Bidders are invited to perform underwater explorations of the site to acquaint themselves with these conditions at no additional cost to the City of New York. No additional compensation will be made after award of contract for any claim related to the pile remnants in the ground. The Contractor is also encouraged to review the Geotechnical Investigation Report, which may be obtained from the City of New York in accordance with Section 01120.
- F. Available Geotechnical Reports

Title	By	For
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

- G. Protect structures, underground utilities, and other construction as necessary from damage caused by pile driving operations.

## PART 2 PRODUCTS

### 2.01 STEEL SHEET PILES AND KING PILES

- A. Sheet piles and king piles shall be heavy gauge hot-rolled sections. Sheet piles shall be fabricated of steel conforming to ASTM A328. King piles shall be fabricated of steel conforming to A572 Grade 50 or approved equivalent of similar or greater strength. Use of cold rolled sheet piling is prohibited. Interlocks shall be free-sliding, allowing a swing angle of at least 5 degrees when threaded and maintain continuous interlocking when installed. Sheet piling, including fabricated sections, shall be full-length sections of the dimensions shown. Provide sheet piling with standard pulling holes. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications.

B. Fabricated Sections

1. Conform to the piling manufacturer's recommendations for fabricated sections.
  2. Metalwork fabrication for sheet piling sections shall conform to the requirements of Section 05120 - Structural Steel.
- C. Cast Steel Shoes: Model X-09800 Hard-Bite Shoes by Associated Pile and Fitting Corporation, Clifton, NJ or approved equal, may be used if hard driving is anticipated or encountered.
- D. Coat steel sheet piles with coal tar epoxy in accordance with the provisions of Section 09967 - Coating for Steel Waterfront Structures.

2.02 SOURCE QUALITY CONTROL

- A. Requirements for material tests, workmanship and other measures for quality assurance shall be as specified and in Section 05120 - Structural Steel.
- B. Piling shall be tested and certified by the manufacturer to meet the specified chemical, mechanical, and section property requirements prior to delivery to the site. Testing of piling for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of piling shall meet the requirements of ASTM A6. The Contractor shall submit mill test reports showing numerical values of chemical and mechanical properties of piling and structural steel, in accordance with the applicable material specifications.

PART 3 EXECUTION

3.01 FIELD TOUCH-UP OF PILE COATING

- A. A compatible touch-up system shall be provided for repair of coating defects, in accordance with the coating manufacturer's recommendations and as approved by the Commissioner.
- B. All touch-up work and coating materials shall be performed in accordance with the provisions of Section 09967 - Coating for Steel Waterfront Structures.
- C. Before and after driving, touch up all abraded surfaces in the coating and clean and touch up all field welds, in accordance with the coating manufacturer's recommendations and as approved by the Commissioner.

3.02 PRECONSTRUCTION SURVEY

- A. Provide general photography and video equipment, analog or digital, capable of superimposing the date and time on all images.



- B. Engage the services of a New York State licensed Professional Engineer to conduct a condition survey of the existing marina seawall.
- C. Provide, as a minimum, the following information:
  - 1. Photographic and videotape documentation of the condition of the seawall.
  - 2. Extent and location of existing signs of distress such as cracks, spalling, signs of settlement, and similar deficiencies.
- D. The Commissioner may accompany the Contractor's Engineer on the condition survey for verification of the data recorded.

### 3.03 VIBRATION AND MOVEMENT MONITORING

- A. Monitor vibration and movement of adjacent existing structures in conformance with Section 01435 and in accordance with the following additional requirements.
- B. Monitor the vibration and movement of the existing concrete block marina wall, located south of the work area approximately 40 feet behind the king pile wall being installed, by use of seismograph instrumentation and position survey.
- C. Establish horizontal and vertical surface monitoring points on the top of the marina wall to be monitored by position surveying methods, located at intervals not exceeding 50 ft along the existing marina wall, extending for a minimum of 100 ft beyond the new king pile sheeting.
- D. Prior to commencement of pile installation, provide and install vibration recorders using 3-component seismographs. The sensors shall be installed on top of the marina wall at points nearest to the pile driving operation, providing coverage for the full length of wall within at least 100 feet of the pile driving operation, relocated as necessary to follow the advancing operation.
- E. Seismograph sensors and accessories shall be maintained and monitored under direction of the qualified specialist. Protect all seismograph equipment from damage.
- F. Connect the seismograph sensors to an automated data acquisition system that continuously monitors vibrations and can trigger alarms when it detects a vibration level that exceeds threshold values stipulated below. Vibration recordings shall be conducted continuously in histogram mode. A real-time display and printing capability is required.
- G. Prior to commencement of the pile installation, conduct measurements of ambient vibration of all installed seismograph sensors. Results in terms of peak particle velocities shall be submitted to the Commissioner before the start of the pile installation.

- H. During pile driving, vibration monitoring shall be conducted continuously on the all seismograph sensors within 100' of the pile being driven, with careful attention the sensor closest to where pile is being driven.
- I. During pile driving, monitor the horizontal and vertical movement of reference points on the marina walls at intervals not exceeding 2 hours for the first five (5) days of pile driving and not exceeding 4 hours thereafter. Obtain and report monitor readings for all points at the conclusion of sheet pile wall installation. Provide measurements and cumulative summary graphs to an accuracy of 0.005 feet. If horizontal or vertical movement at any monitoring point exceeds a limiting value of 0.02 feet from initial position, cease pile driving operations, notify Commissioner and await his direction.
- J. The vibration of the wall caused by the pile installation operations must not exceed the limiting target values indicated in Section 01435. If marina wall movement or other conditions caused by pile driving or other construction activities exceed specified limiting values, the target vibration value will be subject to reduction by the Commissioner.
- K. The Contractor shall inform the Commissioner immediately each time measured particle velocities exceed 85% of the allowable peak particle velocity. Wall movement monitoring readings shall be immediately taken and checked for exceedance of specified limiting values. The Contractor shall make equipment or procedural modifications as required to avoid exceeding the allowable vibration intensity.
- L. If the peak particle velocity recorded at any location exceeds the value specified above, pile installation shall stop immediately. Notify the Commissioner. Propose changes in the pile installation equipment/method that would reduce the vibration on the piers. Pile installation shall not resume until approved by the Commissioner.
- M. Provide certification that the seismographs have been factory calibrated within the past three (3) months. This calibration shall be traced to the National Bureau of Standards. If at anytime during period of the work, the Commissioner determines that the internal calibration indicates errors in the instrument calibration, factory re-calibration or replacement will be required. If the seismographs show any indication of damage or vandalism, as determined by the Commissioner, the seismograph shall immediately be re-calibrated or replaced.
- N. The Contractor shall be in communication with its monitoring firm's personnel during vibration monitoring at all locations to verify the data recorded.
- O. The Contractor shall provide the Commissioner with the results of daily vibration monitoring, one work day after the readings are taken. Upon completion of the construction operations at locations requiring vibration monitoring, the daily submittals shall be synthesized into a final report.

### 3.04 PILE DRIVING EQUIPMENT

- A. Pile Hammer: Use a pile hammer having a delivered force or energy suitable for the total weight of the pile and the character of subsurface material to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy.
- B. Pile Protection: Use a protecting cap during driving to prevent damage to the top of the king piles and sheet piling.
- C. Templates: Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining king piles in their correct position during setting and driving. Provide a stable, heavy, adequately rigid and straight pile driving frame adapted to suit the length and weight of the piles is provided and sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Templates shall not move when supporting king piles. Fit welded bracket guides which take into account width tolerances to hold the king piles at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the king piles from warping or wandering from the alignment. Mark template for the location of the leading edge of each king pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means shall be used to keep the king piles vertical.

### 3.05 PILE DRIVING

- A. Maintain piling vertical during driving. Drive piles in such a manner as to prevent damage to both the king piles and intermediate piles and to provide a continuous closure.
  - 1. Drive piles to tip elevation as shown on the Contract Drawings.
    - a. If refusal is reached within 5 feet of estimated tip, driving may be discontinued.
    - b. If refusal is reached higher than this elevation, and in the opinion of the Commissioner, an obstruction has been encountered, withdraw the king pile, sheet (or pair of sheets), and take appropriate measures to penetrate the obstruction, such as spudding, then continue driving.

2. Locate the king piles in position in the template frame and drive the king piles with extreme care such that they are embedded straight and vertical, ensuring that they are parallel to each other and at the required spacing. The driving sequence of the king piles must ensure that the pile toe encounters compacted soil uniformly on its total circumference and never on one side only. To achieve this, the recommended driving sequence for each set of seven (7) adjacent king piles is as follows:

1 - 5 - 3 - 6 - 4 - 7 - 2

3. In general, drive each king pile in the above sequence to full penetration without interruption. Following successful completion, drive the intermediate Z pile sections. During the setting and driving operations of the king piles constantly check their alignment using theodolites along and normal to the wall.
4. When the template frames have been removed, make a final survey to ensure the deviations in the distance between the king piles are within acceptable tolerances, so as to allow installation of the intermediate sheet piles. If deviations are outside acceptable tolerances, either adjust the intermediate piles or extract and re-drive the king piles.
5. Place a bolt or similar object in the bottom of the king pile connector interlock to minimize packing material into it and ease driving of the intermediate sheets. Remove and replace piles driven out of interlock with adjacent piles.
6. Obstructions
  - a. If boulders or other obstructions restrict driving a king pile or sheet pile to the specified tip elevation, remove the obstructions or penetrate through them with a chisel beam or spud.
  - b. If the Contractor demonstrates, to the satisfaction of the Commissioner, after diligently attempting to remove or penetrate through an obstruction for a minimum period of four hours, that removal or penetration is deemed to be impractical using appropriate methods, tools and equipment, the Contractor will be requested to stop pile driving and request further instructions from the Commissioner. The costs incurred by the Contractor to attempt to remove or penetrate obstructions for the prescribed minimum duration, whether or not the efforts are successful, shall be included in the cost of installing sheet piling and no separate payment will be made therefor.
  - c. Make changes in the design or alignment of the piling as required and directed by the Commissioner to insure the adequacy and stability of the structure.

7. Drive pilings to depths shown and extend up to the elevation indicated for the top of pilings.
  8. Pilings shall not be driven within 50 feet of concrete less than 3 days old.
  9. Excavation inside king pile pairs will be permitted to overcome difficult driving conditions or to meet vibration and marina wall movement limits specified. Jetting, pre-augering or spudding of piles may be considered on a limited basis, but will not be permitted unless approved by the Commissioner.
  10. Remove and replace pilings damaged during driving or driven out of interlock when directed by the Commissioner at no additional cost to the City of New York.
  11. Additional costs induced in modifying pile cap, as a result of piles driven out of tolerances, including design costs, shall be at the Contractor's expense.
- B. Tolerances in Driving: Drive all piles with a variation from vertical of not more than 1/4 inch per foot. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut-off shall be within 2 inches horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.
- C. Cutting Off and Splicing
1. After piling has been driven to the required depth and piling extends above the top elevation indicated on the Drawings, cut off at indicated elevation after approval by the Commissioner. Trim the tops of sheet piles damaged to an extent that would prevent proper additional driving, or that would detrimentally affect appearance if exposed in the finished Work.
  2. Pilings driven to refusal or to the point where additional penetration cannot be attained and extend above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation.
  3. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed by the Commissioner at no additional cost to the City of New York. If so directed, pilings shall be spliced as required to drive them to depths greater than shown and extend them up to the required top elevation.
  4. Pilings adjoining spliced pilings shall be full length unless otherwise approved. Splicing of pilings, where permitted, shall use full penetration butt welds. Ends of pilings to be spliced shall be squared off before splicing to eliminate dips or camber. Splice pilings together with concentric alignment of

the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced pilings shall be free sliding and able to obtain the maximum swing with contiguous pilings. Welding of splices shall conform to the requirements of Section 05120 - Structural Steel. Shop and field welding, qualification of welding procedures, welders, and welding operators shall be in accordance with AWS D1.1.

5. Trim the tops of pilings excessively damaged during driving when directed by the Commissioner, at no cost to the City of New York. Pile cut-offs shall become the property of the Contractor and shall be removed from the site.
6. Cut holes in pilings for elastomeric fender units as shown or as directed by the Commissioner. Perform all cutting in a neat and workmanlike manner. Use a straight edge in cuts made by burning to avoid abrupt nicks. Drill or burn and ream bolt holes in piling by approved methods that will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.
7. Do not use explosives for cutting.

- D. Fender Installation: Furnish and install elastomeric fender units on king piles in accordance with the requirements of Section 02396.

### 3.06 FIELD QUALITY CONTROL

- A. Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems that may occur to the attention of the Commissioner.
- B. Inspection of Driven Piling: The Contractor shall inspect the interlocks of the portion of driven piles that extend above ground. Remove and replace piles found to be out of interlock.
- C. Installation Records: Maintain a pile driving record for each king and sheet pile. Indicate on the installation record installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations, pile plumbness, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to the Commissioner.

-END OF SECTION-

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

NO TEXT ON THIS PAGE

**B. Payment****1. Marine Timber Piles**

- a. The unit price per linear foot of marine timber pile incorporated in the work shall include the cost of furnishing, fabrication, delivery, storage and handling, installation, equipment, maintaining in proper condition, removal, re-installation, obstruction removal, shoes, shop and field splices, and other incidentals necessary to properly perform the work complete and in place as detailed on the Contract Drawings and accepted by the Commissioner.
- b. The basis for payment shall be the aggregate measured length of approved marine timber piles actually incorporated in the work, delineated by the specified unit of measurement, multiplied by the corresponding contractual unit price shown on the Bid Form.
- c. Timber piles may be added or deleted as directed in writing by the Commissioner and paid for at the contractual unit price per linear foot.
- d. No separate payment will be made for inspection of marine timber piles, pile tips, removing damaged or misdriven piles, piles driven for the temporary use or for the convenience of the Contractor, pre-drilling, removal of obstructions, jetting, spudding, pile surveys and related drawings, pile cutoffs and their disposal off-site. The costs thereof shall be included in the unit price bid for marine timber piles.

**2. Unacceptable Piles**

- a. Unacceptable timber piles are defined as piles that fail minimum penetration requirements, are placed or cut off in positions beyond specified tolerances, or are damaged.
- b. Unacceptable timber piles shall be replaced with piles that conform to specified requirements. Alternatively, in lieu of replacing unacceptable piles, additional timber piles may be placed in locations other than those shown on the Contract Drawings. This alternative may be used only with prior approval of the Commissioner for each individual location of use.
- c. The Commissioner will determine if pile deficiency is due to unavoidable field conditions, such as an immovable or impenetrable obstruction, or due to Contractor operations.
- d. If the Commissioner deems that the deficiency of a pile is due to Contractor operations, all costs for replacement piles or design, analysis and construction of alternative designs shall be at the expense of the Contractor.



**Section 02464**  
**MARINE TIMBER PILES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install a new timber fender pile cluster including blocking, wire rope wrappings and appurtenant items, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. This Section includes, but is not limited to, the following items:
  - 1. Timber Fender Piles
  - 2. Galvanized Hardware
  - 3. Wire Rope and Fittings
  - 4. Pile Caps
  - 5. Pile Driving Equipment

**1.02 RELATED SPECIFICATIONS**

- A. Section 02398 – Marine Timberwork
- B. Section 02457 – Steel Sheet Piles

**1.03 MEASUREMENT AND PAYMENT**

- A. Measurement
  - 1. Marine Timber Piles: The quantity of marine timber piles to be measured for payment at the unit price bid will be the actual length of piles, in linear feet, driven or installed and left in place in conformity with the Contract Drawings and the Specifications or as directed by the Commissioner.
  - 2. The approved quantity of piles actually incorporated in the work, delineated by the specified unit of measurement, will be the basis for payment. The linear footage of pile to be measured for payment shall be the length in place below the cutoff elevation measured to the pile tip. Any part of the pile remaining above the cutoff elevation specified or otherwise directed will not be measured for payment.
  - 3. Units of measurement for the work specified in this Section shall be as follows:
    - a. Marine Timber Piles – linear feet.

- e. If the Commissioner deems that the deficiency of a pile is due to unavoidable field conditions, the costs for replacement or additional piles will be paid for at the contractual unit price for marine timber piles. Pile driving and removal of partially installed piles deemed to be obstructed and abandoned by the Commissioner will also be paid at the contractual unit price for marine timber piles.

#### 1.04 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and the latest addenda thereto of the following standards to the extent referenced. The publications are referred to in the text by the basic designation only.

- 1. American Society for Testing and Materials (ASTM)

- a. ASTM A123, Zinc (Hot Dipped) Galvanized Coatings on Iron and Steel Products.
- b. ASTM A153, Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- c. ASTM A307, Carbon Steel Externally Threaded Standard Fasteners.
- d. ASTM A1011, Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- e. ASTM B209, Aluminum and Aluminum-Alloy Sheet and Plate.
- f. ASTM D25, Round Timber Piles.
- g. ASTM A563, Carbon and Alloy Steel Nuts.
- h. ASTM D 5893, Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
- i. ASTM F 2329, Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

- 2. American Wood Protection Association (AWPA)

- a. AWPA M4, Care of Preservative Treated Wood Products
- b. AWPA M6, Brands Used on Forest Products
- c. AWPA P5, Water Borne Preservatives
- d. AWPA U1, Use Category System: User Specification for Treated Wood

3. Western Wood Preservers Institute (WWPI)
  - a. BMP, Best Management Practices for the Use of Treated Wood in Aquatic Environments - Joint Publication with Canadian Institute of Treated Wood.
4. Federal Specifications (FS)
  - a. FS RR-W-410, Wire Rope and Strand.
5. U.S. Department of Defense (DOD)
  - a. MIL-P-21035, Paint, High Zinc Dust Content, Galvanizing Repair (Metric).
6. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
7. New York City Board of Standards and Appeals (BS&A) , latest edition and amendments or supplements thereto.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  1. Qualification Submittals: Submit qualifications demonstrating compliance with Articles 1.06B and 1.06C as applicable.
    - a. Installer: Submit qualifications of the Contractor's installer demonstrating experience monitoring and certifying pile installations of similar type and capacity to those of this Project.
    - b. Contractor's Surveyor: Submit qualifications of the Contractor's Surveyor demonstrating experience in surveying pier piles over water similar to those of this Project.
    - c. Vibration Monitoring Specialist, Movement Monitoring Surveyor and Commissioner to perform preconstruction survey: Conform to Section 02457 – Steel Sheet Piles.
  2. Product Data
    - a. Timber Piles: Identify material, size(s), treatment, and source.
    - b. Materials and Safety Data Sheets (MSDS) and Consumer Information Sheets (CIS): Submit Materials and Safety Data Sheets (MSDS) and

Consumer Information Sheets (CIS) associated with timber pile preservative treatment. The Contractor shall comply with all safety precautions indicated on MSDS and CIS.

c. Hardware

d. Equipment Data – For Information: Include to identify as a minimum:

- (1) Driving equipment
- (2) Driving helmet and cushion blocks
- (3) Cushion block

3. Quality Control Submittals

a. Certificates of Compliance

- (1) Driving hammer
- (2) Treated Timber Piles: Submit certification with inspection report of an independent inspection agency that preservative treatment of timber (wood) piles for this Project complies with this specification as a minimum and applicable AWWA and WWPI BMP's standards in accordance with Article entitled "Quality Assurance" herein. Submit example of identifying mark that will be exhibited on each timber pile as specified in Article entitled "Quality Assurance" herein.
- (3) Provide documentation that driving procedure proposed will not exceed vibration limits or marina wall movement limits specified herein. The documentation should include but not be limited to: chart(s) and/or graph(s) relating vibration transmission to distance from source, the specifications of the equipments that were used to generate the chart(s) or graph(s), the soil conditions if the chart(s) or graph(s) were derived from vibration test(s) and/or measurements from similar project(s). The equipment data pertinent to the chart(s) shall be consistent with that of proposed procedure and method.

4. Record Documents: Submit the following:

a. Field Quality Control Records: Submit pile-driving records as specified and as may be otherwise requested by the Commissioner.

## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Provide the services of a general contractor or a specialty subcontractor that specializes in the installation of marine timber piles and can demonstrate at least three years of relevant experience in the installation of marine timber piles under similar conditions.
- C. Provide the services of an independent surveyor, licensed in the State of New York and approved by the Commissioner, to perform surveys and layouts and to determine vertical and horizontal alignments.
  - 1. The installed location of each pile shall be established and verified by survey.
  - 2. Survey information may be submitted on several drawings, each covering a partial area only, as the job progresses, to expedite the approval of the pile work. Upon completion of all pile driving, the Contractor shall submit to the Commissioner AutoCAD drawings having the same locations of all the piles, including obstructed, damaged and compensating piles, percentage out of plumb and the cut-off elevation and length below cut-off elevation for each pile.
  - 3. Conform to the requirements of the General Conditions.
- D. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- E. Timber Piles Preservative Treatment
  - 1. The Contractor shall be responsible for the quality of treated wood products.
  - 2. Identify treatment on each piece by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee.
  - 3. Inspect all preservative treated wood visually to ensure there are no excessive residual materials or preservative deposits. Unless treated piles have aged at least six (6) months prior to installation, treatment shall conform to WWPI BMP to avoid leaching of preservative chemicals into the waterway.
  - 4. The Contractor shall submit inspection report(s) of an independent inspection agency, approved by the Commissioner that offered products (each pile) that comply with applicable AWWA standards and WWPI BMP's. Materials shall be clean and dry or it will be rejected because of environmental concerns.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store and handle piles in accordance with industry accepted methods to avoid damage or deformation of the piles.
- B. Special care shall be taken to avoid damaging the surface of timber piles. Hooks or tongs shall not be used; slings and lines shall be non-abrasive. Use of steel cable and chain will not be permitted.

**1.08 SITE CONDITIONS**

- A. Geotechnical investigations have been undertaken at the site and a Geotechnical Report is available as described in Section 01120 –Contract Summary. The Contractor may use this report to establish the quality of materials expected to be present at the project site and determine the proper length of piles. The Contractor is advised that all available samples and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of the Contract, but are available for information purposes only.
- B. The Contractor is responsible for any conclusions it may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. Neither the City of New York nor the Commissioner guarantees that materials other than those disclosed by the geotechnical report will not be encountered, or that proportions and character of the various materials will not vary from those indicated in the boring logs.
- C. Data on indicated subsurface conditions is not intended as a representation or warranty of continuity of such conditions. It is expressly understood that neither the City of New York nor the Commissioner will be responsible for interpretations or conclusions drawn wherefrom by the Contractor.
- D. If the Contractor finds that the investigations are not sufficient to determine the nature of the work, the Contractor can undertake its own investigations before or after submission of its bid at its own expense.
- E. Available Geotechnical Reports

<b>Title</b>	<b>By</b>	<b>For</b>
Report on Geotechnical Investigation – Southwest Brooklyn, Marine Transfer Station Conversions, New York City Department of Sanitation	Haley & Aldrich of New York	Greeley & Hansen, LLC

- F. Prior to bidding this project, the Contractor shall thoroughly explore the underwater conditions at the site to be fully informed about the piles left in the ground after demolition of the previous pier and in the area where the piles will be driven.

Bidders are invited to perform underwater explorations of the site to acquaint themselves with these conditions at no additional cost to the City of New York. No additional compensation will be made after award of contract for any claim related to the pile remnants in the ground. The Contractor is also encouraged to review the Geotechnical Investigation Report, which may be obtained from the City of New York in accordance with Section 01120.

- G. Protect structures, underground utilities, and other construction as necessary from damage caused by pile driving operations.

## PART 2 PRODUCTS

### 2.01 PILES

- A. Timber Piles: Provide Douglas Fir or Southern Pine clean peeled piles conforming to ASTM D25. The producer shall brand each treated pile in accordance with AWP A M6.
  - 1. Pile shall be fresh cut stock. Use of warehouse material stored over 90 days is prohibited.
  - 2. Treat piles with waterborne preservative conforming to AWP A Specification P5. Treatment shall conform to AWP A U1, Use Category UC5A Marine Use Northern Waters, with waterborne preservatives. Each treated pile shall be branded by the producer in accordance with AWP A M6 that identifies the treatment by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee.
- B. Piles shall be in one piece. Splices will not be permitted. Pile butt circumference shall be not less than 44 inches as measured 3 feet from the butt. Piles shall be driven to the minimum pile tip elevation shown on the Contract Drawings, or deeper if needed to reach a minimum bearing capacity of 15 tons as determined by Table 11-5 of the Building Code of the City of New York. Cut-off elevation shall be as indicated on the Contract Drawings. Ordered lengths shall be sufficient to allow a minimum one-foot cut-off should the butt be damaged during installation, and a minimum of ten (10) feet deeper tip elevation than shown on the Contract Drawings if needed to reach the minimum bearing capacity. The first pile driven shall be one of the vertical piles, and shall be used as an indicator pile to determine the necessary tip elevation for subsequent piles. Driving records for the first pile shall be submitted to the Commissioner for evaluation prior to driving subsequent piles. Subsequently driven piles shall be shortened as directed by the Commissioner by cutting off unnecessary length from the pile tips prior to driving.
- C. Pile Quality
  - 1. All timber piles shall be of sound timber suitable for driving, cut above the ground swell, free from decay, unsound knots, knots in groups or clusters,

windshakes and short or reversed bends. The maximum diameter of any sound knot shall be one-third the diameter of the pile section where the knot occurs, but not more than four (4) inches in the lower half of pile length nor more than five (5) inches otherwise. All knots shall be trimmed flush with the body of the pile and ends shall be squared with the axis.

2. Timber piles shall have reasonably uniform taper throughout their length and shall be so straight that a line joining the centers of point and butt shall not depart from the body of the pile. No bark or wane shall be measured in required dimensions. The diameter at any pile section is the average of the maximum and minimum dimensions at that section.
3. Inspection of Timber Piles: With every delivery and before the material is accepted, the Contractor shall furnish a certificate of satisfactory inspection issued by the lumber association or agency of the material furnished. This certificate shall certify that the material furnished complies with the requirements of the specifications.

## 2.02 HARDWARE AND ACCESSORIES

- A. Hot dip galvanize all steel items according to ASTM F 2329 for bolts, nuts, screws and washers, and ASTM A123 or A153 as applicable for other materials, with a minimum of 4 mils of zinc coating. Provide bolts with nuts and washers, screws, spikes, and other metal fastenings. Bolts shall be ASTM A307, Grade A with ASTM A563 nuts. Bolt heads and nuts shall be square. Washers shall be plate or cut washers as indicated. Provide bolts with washers under nut and head.
- B. Wire Rope And Fitting: FS RR-W-410, Type III, Class 2, zinc coated or FS RR-W-410, Type I, Class 2. Provide 0.38-inch diameter zinc-coated steel staples not less than 5 inches in length. Provide clips or clamps of zinc-coated steel.
- C. Pile Caps: Provide 0.040-inch aluminum alloy sheet, Alclad 3003, 3004, or 3005 in accordance with ASTM B209. Form fit to pile butt with 2-inch minimum turndown around circumference.
- D. Pile Shoes: ASTM A1011/A1011M. Steel boot or welded-plate point shoe especially fabricated for pile driving. Shoes shall be the product of a manufacturer regularly engaged in the manufacture of pile fittings. Welding procedures shall be in accordance with a nationally recognized welding code. Provide size to fit pile tip. Fabricate boot type of 3/16 inch carbon steel fully welded, with at least three straps, each with three 3/16 inch nail holes. Fabricate welded-plate point type of four 3/16 inch or 1/4 inch steel plates, fully welded and sized to adequately cover full pointed area of pile; provide each plate with one 3/16 inch or one 1/4 inch nail hole. The length of the joints formed by the intersection of the sides shall not be less than one half of the height of the shoe. Shoes may be furnished without painted finish. Provide on the point of each softwood pile.



## E. Silicone Sealant

1. One-part silicone formulation ASTM D 5893, Type NS except use Type SL for horizontal applications. Acetic acid cure sealants will not be permitted.
2. Acceptable Products – Type SL, Self Leveling
  - a. Crafcro Roadsaver Silicone SL by Crafcro Inc., Chandler (Phoenix), AZ
  - b. CSL 315 by CSL Silicones, Guelph, Ontario
  - c. Dow Corning 890SL by Dow Corning Corp., Midland, MI
  - d. Pecora 300SL by Pecora Corporation, Harleyville, PA
  - e. Spectrem 900SL by Tremco Incorporated, Beachwood, OH
  - f. Or approved equal
3. Acceptable Products – Type NS, Non-Sag
  - a. Crafcro Roadsaver Silicone by Crafcro Inc., Chandler (Phoenix), AZ
  - b. CSL 342 by CSL Silicones, Guelph, Ontario
  - c. Dow Corning 888 by Dow Corning Corp., Midland, MI
  - d. Flexseal 310 by Roadseal Technology, Inc., Tucson, AZ
  - e. Pecora 301 NS by Pecora Corporation, Harleyville, PA
  - f. Spectrem 800 by Tremco Incorporated, Beachwood, OH
  - g. Or approved equal

F. Wood Preservative (For Field Treatment Applications): Comply with the requirements of AWWA M4.

G. Galvanized Repair Coating: Conform to MIL-P-21035 and to requirements specified for Field Treatment herein.

## 2.03 PILE DRIVING EQUIPMENT

- A. Select driving equipment and driving procedure which will not exceed vibration and marina wall movement limits specified herein.
- B. Capacity: Pile driving hammers shall be of sufficient weight and energy to install the specified pile without damage into the soils expected to be encountered. If, in the opinion of the Commissioner, satisfactory results are not obtained with the hammer furnished by the Contractor, a hammer meeting the approval of the Commissioner shall be furnished and used, but at no time shall a striking energy of 13,500 ft.-lbs per blow be exceeded.
- C. Operating Speed: Sufficient boiler or compressor capacity shall be provided at all times to maintain the rated speed of hammer during the full time of driving a pile. The valve mechanism and other parts of the hammer shall be maintained in first class condition so that the length of stroke, for a single acting hammer, and the number of blows per minute, for a double acting hammer, for which the hammer is

designed, will be obtained. Any double acting hammer not operating at the rated hammer speed specified in the manufacturer's catalogue, for the particular hammer being used, shall be deemed unsatisfactory and shall be removed from the site.

- D. Diesel Hammers: All Diesel hammers shall be provided with an acceptable means of measuring hammer energy. When pressure gages are included as normal equipment, they shall be furnished and maintained in operable condition. Manufacturer's charts and graphs, required to calibrate hammer energy, shall be furnished to the Commissioner by the Contractor. The Contractor shall also arrange easy access to the pressure gages so that readings may be conveniently taken by the Commissioner.
- E. Leads: Pile driver leads shall be constructed in such a manner as to afford freedom of movement of the hammer. The use of either swinging or hanging leads will be permitted provided the pile is properly supported during driving and the desired final position and batter of pile is achieved. In the event the Commissioner determines that the use of swinging or hanging leads is producing unsatisfactory results, he may require the Contractor to hold the leads in position with guys or stiff braces to give the required support. The Contractor may, as an alternative, replace the unsatisfactory equipment with new equipment having fixed leads. Pile driving leads shall be of sufficient length so that the use of a follower will not be necessary. The driving of piles with followers shall be avoided if practicable and shall be done only with written permission of the Commissioner and at the direction of the Commissioner.
- F. Driving Helmets and Cushion Blocks
  - 1. A driving helmet or cap including a cushion block or cap block of a design acceptable to the Commissioner shall be used between the top of the pile and the ram to prevent impact damage to the pile. The driving helmet or cap and cushion block combination shall be capable of protecting the head of the pile, minimize energy absorption and dissipation, and transmit hammer energy uniformly and consistently during the entire driving period.
  - 2. The driving helmet or cap shall fit loosely around the top of the pile may rotate slightly without binding within the driving head.
  - 3. The cushion block shall be a solid or laminated softwood block with the grain Parallel to the end of the pile enclosed in a close-fitting steel housing. The thickness of block shall be suitable for the length of pile to be driven and the character of subsurface material to be encountered. Generally, thicker blocks shall be provided for longer piles and softer subsurface material. Helmet or block shall uniformly transmit energy to pile with a minimum loss of energy.
  - 4. The cushion block shall be replaced if it has been damaged, split, highly compressed, charred or burned, or has become spongy or deteriorated in any manner.

5. Under no circumstances will the use of small wood blocks, wood chips, rope or other material permitting excessive loss of hammer energy be permitted.
6. Prior to the start of pile driving operations, the Contractor shall submit detail drawings of the cushion block, including records of successful use where the block is other than that specified above.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Layout and Field Survey Work: Conform to the requirements described in the General Conditions.

#### 3.02 PRECONSTRUCTION SURVEY, VIBRATION MONITORING AND WALL MOVEMENT MONITORING

- A. Conform to the requirements of Section 02457 – Steel Sheet Piles, including vibration limits and wall movement limits specified therein.

#### 3.03 PILE INSTALLATION

- A. Inspect piles when delivered and when in the leads immediately before driving.
- B. In developing proposed pile installation procedures and selecting equipment, the Contractor shall consider and be prepared to respond to local conditions. It shall be the responsibility of the Contractor to select methods and equipment which will result in satisfactory installation of the piles.
- C. Driving Piles: Operate hammer at manufacturer's rated speed, and drive piles without interruption to a minimum pile tip elevation as shown on the Contract Drawings for cluster piles unless refusal at bedrock is encountered at a higher elevation. Refusal at bedrock is defined as 5 blows per 1/4-inch of penetration for 10 consecutive blows under the action of the approved hammer. The driving of piles shall be done with the steam, diesel or pneumatic hammer and in the order approved by the Commissioner.
  1. Drive all piles with a positioning template.
  2. Tolerances in Driving: Piles shall be driven in the locations indicated on the Contract Drawings. Piles may be manipulated a maximum of 1 inch per 10 foot of pile length above mud line. Remove and replace with new piles those damaged, mislocated, driven below the design cutoff, or driven out of alignment.
  3. Protection of Piles: Square the heads and tips of piles to the driving axis. Laterally support piles during driving, but do not unduly restrain piles from

rotation in the leads. Where pile orientation is essential, take precautionary measures to maintain the orientation during driving.

- D. Piles shall be installed with due consideration for the safety of adjacent structures and subsurface construction, by a method which leaves their strength unimpaired. If conditions at the site are such that the tip, the body or the butt of the pile is likely to suffer damage during driving, special precautions shall be taken to avoid such damage.
- E. Broken or damaged piles shall not be used in the work.
- F. Any pile which is raised or heaved during driving of adjacent piles shall be redriven to at least the original required tip elevation or as otherwise directed by the Commissioner.
- G. Loose and displaced material forced up around piles during driving shall be removed.
- H. Piling shall be restrained from lateral movement at intervals not exceeding 20 feet over the length between the driving head and the ground surface.
- I. Jetting, pre-drilling or pre-augering is not permitted unless approved by the Commissioner.
- J. The pile driver lead shall be marked legibly with paint at intervals of one foot, fixing the zero point at the deck of the pile driver scow. Tide staffs or other elevation controls shall be installed.
- K. The piles shall be supported and braced during installation until they are fixed in the permanent work as required to assure proper location of the piles. The supports, braces and guides shall be frequently verified to insure that they are holding the piles to line and slope. Supports, braces and guides shall be removed only upon approval of the Commissioner.
- L. The correct relative position of piles in clusters shall be maintained.
- M. Piles which, in the opinion of the Commissioner, have been disturbed shall be re-driven.
- N. After the piles are driven and accepted, they shall be cut off to true planes at the required elevation. No shims of any description will be permitted.
- O. Driving of piles shall not take place within 50 feet of concrete placed within 3 days unless otherwise approved by the Commissioner.

## 3.04 PILE OBSTRUCTIONS

- A. Boring logs for boreholes previously drilled at the project site indicate the presence of boulders and obstructions, such as pile remnants and construction debris. If such obstructions are encountered, and piles reach premature refusal during pile driving, the Contractor shall notify the Commissioner immediately.
- B. The Contractor shall probe to locate the extent of the obstruction and propose a method of passing or removing the obstruction, including the use of a chisel beam, spud, by drilling or by other suitable means.
- C. If the Contractor demonstrates, to the satisfaction of the Commissioner, after diligently attempting to remove or penetrate through an obstruction for a minimum period of four hours, that removal or penetration of the obstruction is deemed to be impractical using appropriate methods, tools and equipment, the Contractor will be requested to stop pile driving operations and await further instructions from the Commissioner. The costs incurred by the Contractor to attempt to remove or penetrate obstructions for the prescribed minimum duration, whether or not the efforts are successful, shall be included in the unit price bid for marine timber piles and no separate payment will be made therefore.
- D. If the Commissioner declares the obstruction to be an unavoidable field condition, the Contractor will be directed to remove the partially installed pile and make changes in the design or alignment of the piling structure as required by the Commissioner to insure the adequacy and stability of the structure.
- E. Payment for installing and removing the obstructed pile and for installing replacement or additional piles will be made at the contractual unit price for marine timber piles.
- F. Payment for additional labor and materials necessitated by changes in the design or alignment of the piling structure will be made at applicable contractual unit prices or by Change Order in accordance with the General Requirements.

## 3.05 REJECTION OF PILES

- A. The following shall be cause(s) for rejection of a pile:
  - 1. Pile location or batter is incorrect.
  - 2. Pile damaged from any cause whatsoever.
  - 3. Pile is determined by the Commissioner to be unserviceable for other reasons related to the furnishing and installing of the pile.
  - 4. Piles which are driven so that, when cut off, the tops are below the elevation fixed by the Contract Drawings or as established by the Commissioner, shall

be withdrawn and replaced by new and, if necessary, longer piles at the expense of the Contractor.

5. Piles that are split, splintered or broomed from driving operations are not acceptable. Any pile broken by reason of internal defects (even though the Commissioner permitted it to be put in the leads), or by improper driving shall be rejected.
- B. The Contractor shall remove and replace such rejected piles. No additional payment will be made for removal, replacement or repair of rejected piles. No additional payment will be made for backfilling of cavities left by the extraction of rejected piles or from augur holes or soil deformations necessary to place pile. No additional payment will be made for re-driving piles that are forced up by any cause.
- C. If the Contractor removes any piles driven in the permanent work for his convenience, for the prosecution of the work, or for any other reason, except at the direction of the Commissioner, the Contractor shall replace such piles at no additional cost to the City of New York.

### 3.06 FIELD FABRICATION

- A. Cut piles at cutoff grade with pneumatic tools by sawing. Pile heads at cutoff shall be sound. Piles cut off lower than required shall be removed and replaced with a new pile at no additional cost to the City of New York. If piles are cut off higher than required, they shall be re-cut. Secure piles in their proper alignment and cut piles at cutoff grade with pneumatic tools by sawing or other approved method. Fabricate and install wood blocking in accordance with the provisions of Section 02398 – Marine Timberwork. Counter-bore holes for bolts where indicated for countersinking bolt heads and washers. After installation of bolts, fill counter-bored holes with an approved bituminous material. Drill holes for through bolts 1/16 inch larger than diameter of bolt shank. Drill holes for lag bolts not larger than body of bolt at base of tread. Piles shall have tops beveled outboard as indicated and fitted with specified pile caps. Do not dap piles for blocking; dap the blocks or use beveled blocks.
- B. Fastening: Use washers of the size and type specified under bolt heads and nuts which would otherwise come in contact with wood.
- C. Wrapping Piles: Notch outboard faces of piles to be in contact with wire rope so that when wrapped the rope shall be flush with face of the pile. Notch only those piles which will be exposed to contact during berthing. Draw piles tightly together with wire rope. Fasten each turn of the wire rope with a staple to each pile with which it is in contact. Fasten ends of wire rope with two clips or clamps. Number of turns shall be as indicated on the Contract Drawings. Through bolts shall be in place and drawn up before wrapping is finally secured.

**D. Field Treatment**

1. **Piles:** Fill notches for wire rope with hot pitch or a bitumastic compound before placing wire rope. Field treat cuts, drilled holes, bevels, notches, re-facings, and abrasions made in the field in accordance with AWWA M4, MSDS and CIS. Wood preservatives are restricted-use pesticides and shall be applied according to applicable standards. Trim cuts and abrasions before field treatment. Apply field treatment to depressions or openings around bolt holes, joints, or gaps including recesses formed by counterboring, with preservative treatment used for piles or timber. After bolt or screw is in place and treatment applied, fill depressions and openings with silicone sealant.
2. **Galvanized Surfaces:** Repair and recoat zinc coating which has been field or shop cut, burned by welding, abraded, or otherwise damaged to such an extent as to expose the base metal. Thoroughly clean the damaged area by wire brushing and remove traces of welding flux and loose or cracked zinc coating prior to painting. Paint cleaned area with two coats of galvanizing repair paint. Compound paint with a suitable vehicle in a ratio of one part zinc oxide to four parts zinc dust by weight.

**3.07 FIELD QUALITY CONTROL**

- A. All marine timber pile inspections will be performed by the Commissioner or designated representative. The Contractor shall assist and provide access to the work area for field inspection by the Commissioner. The Contractor shall cooperate with the Commissioner in determining the minimum tip elevation required and shall mark each pile before driving as required.
- B. The driving of each pile shall be performed in the presence of the Commissioner unless otherwise directed.
- C. When inspections result in pile rejection by the Commissioner, the Contractor shall promptly segregate and remove rejected pile from the premises.
- D. **Inspection of Driven Piling:** The Contractor's Professional Engineer shall perform continuous inspection during pile driving and certify piles are installed in accordance with requirements herein. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Commissioner.
- E. **Installation Records:** Maintain a pile driving record for each pile. These records shall be compiled and attested to by the Contractor's registered Professional Engineer. Driving records shall include:
  1. Project name and number
  2. Name of Contractor and Installer

3. Pile size and dimensions
4. Elevation of point, elevation of butt before and after cut-off
5. Continuous record of number of blows for each foot of penetration and final driving resistance in blows for final 6 inches
6. Installation dates and times
7. Driving equipment used including type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used
8. Pile number and locations, tip elevations, ground elevations, cut-off elevations
9. Length of driven pile from final tip elevation to cut-off elevation.
10. Any reheading or cutting of piles.
11. Alignment and plumbness checks
12. Locations and depths where difficulty in driving was encountered
13. Any unusual pile driving problems.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 02501**  
**REINFORCED CONCRETE SEWER PIPE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall furnish and install reinforced concrete sewer pipe, fittings and specials.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 02503 - Installation of Buried Pipelines
- C. Section 02505 - Leakage Tests

**1.03 REFERENCES**

- A. ASTM B127 - Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
- B. ASTM C31 - Making and Curing Concrete Test Specimens in the Field
- C. ASTM C39 - Compressive Strength of Cylindrical Concrete Specimens
- D. ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
- E. ASTM C361 - Reinforced Concrete Low-Head Pressure Pipe
- F. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric)
- G. ASTM C497 - Testing Concrete Pipe and Tile

**1.04 DESIGN REQUIREMENTS**

- A. Design: Provide the classes of reinforced concrete sewer pipe as shown or specified in Section 02503 – Installation of Buried Pipelines. Conform pipe designs with the following requirements.
  - 1. Use diameter, wall thickness, compressive strength of concrete and area of circumferential reinforcement as prescribed for Classes I to IV in Tables 1 to 5 in ASTM C76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats. Do not substitute modified designs for designs shown in the tables.
  - 2. Provide special designs only for pipe with diameters and loads beyond those shown in Tables 1 to 5, pipe diameters that do not have steel reinforcement

areas shown in the tables and pipe subject to thrust forces encountered in jacking operations. Conform special designs with the requirements of Section 7.2.2 of ASTM C 76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats without prior approval. Retain a Registered Professional Engineer, licensed in the State of New York, to prepare, sign and seal all special designs for pipe.

- B. Precast reinforced concrete pipe shall conform to the requirements of ASTM C76 for circular steel reinforcement and the three-edge bearing strength test requirements for the load to produce the 0.01 inch crack and for the ultimate load. When the strength test requirements specified in the piping schedule are greater than the strength test requirements of ASTM C76, the thickness of the pipe wall may be increased, the area of circular steel reinforcement increased, or a combination of these, all as approved by the Engineer.

C. Joints

1. Provide joints for pipe, fittings and specials in gravity sewer and drain lines meeting the requirements of ASTM C443 and this Specification.
2. Provide joints for pipe, fittings and specials in low pressure concrete lines with test pressures of 125 ft. or less meeting the requirements of ASTM C361 and these specifications.

1.05 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Shop Drawings: Submit complete shop drawings for all diameters and classes of reinforced concrete pipe, fittings and specials and for concrete sills showing dimensions, strength and materials specifications and standards, joint details and reinforcement position for approval prior to manufacture. Include the following information on the shop drawings.
1. Diameter of pipe
  2. Area of all cages of reinforcing steel
  3. A minimum clearance of one inch for each cage of circumferential reinforcing steel shown
  4. Angle of the joint
  5. Length and thickness of bell and spigot
  6. Length and thickness of joint

7. Manufacturer, size and type of gasket
  8. Manufacturer's recommendations for gap dimension and tolerance for a properly installed pipe joint
  9. Signature and title of authorized representative of the manufacturer
- C. Materials Compliance: Submit notarized affidavits of all materials compliance with ASTM C 76.
- D. Product Compliance: Submit notarized affidavit of pipe compliance with ASTM C 76 and these specifications.
- E. Joint Compliance: Submit notarized affidavit of joint compliance with ASTM C443 and these specifications for each pipe size. The statement shall include date of test.
- F. Quality Control: Submit certified results of all shop tests for approval.

#### 1.06 QUALITY ASSURANCE

- A. General: Provide concrete pipe, fittings and specials that are precast or machine made and are the product of a company that can demonstrate by tests and installation records satisfactory experience in manufacturing concrete pipe of the quality and type specified.
- B. Reinforced Concrete Pipe: Provide reinforced concrete pipe meeting the requirements of ASTM C 76 and these specifications.
- C. Joints: Provide joints for pipe, fittings and specials meeting the requirements of ASTM C 443 and these specifications.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Do not ship pipe to the site of the work until the pipe test results are certified by the Engineer.

### PART 2 PRODUCTS

#### 2.01 REINFORCED CONCRETE PIPE

- A. Manufacture
1. Do not use admixtures or blends in concrete without prior approval.
  2. The manufacturer shall maintain a satisfactory manufacturing schedule and shall have adequate storage facilities so that the work will not be delayed.

3. Cast pipe in steel forms to the exact dimensions shown, specified or required. Unless otherwise shown or specified, the inner and outer rings of reinforcement shall be concentric. Provide chairs and spacers to insure and maintain the proper position of reinforcement steel with respect to the protective concrete covering. Pipes in which reinforcing steel is placed beyond the tolerances allowed by ASTM C76 will be rejected. Use metal spacers at the top between the inner and outer forms to maintain uniform wall thickness in casting pipe. Where reinforcement mesh is used in the pipe, curve such reinforcement to shape on rolls having grooves for the longitudinal wires. In casting pipe, do not cut wires for form spacers or for other purposes. Provide continuous internal vibration of concrete during the pouring operation.
  4. The Contractor will be responsible for meeting all requirements for the manufacture of precast pipe and checking at regular intervals all of such requirements.
- B. Lengths: Manufacture all reinforced concrete pipe in lengths of not more than 16 feet and not less than 8 feet as follows, except where shorter lengths are required and approved for pipeline curves or at junctions with structures.
1. Furnish subaqueous pressure pipe in lengths of not less than 16 feet for pipe up to and including 84 inches in diameter. Pipe larger than 84 inches in diameter may be of lengths less than 16 feet, decreased on a sliding scale in accordance with the manufacturer's recommendations and as approved by the Engineer.
  2. Furnish pressure pipe to be installed inland in lengths not less than 12 feet, except that pipe to be laid in sheeted trench shall be furnished in lengths not less than 8 feet.
- C. Labeling: Immediately after the stripping of forms, all pipe manufactured for the DSNY as required under this contract shall be marked and identified with the following data: DSNY, contract name and number, class and diameter of pipe, number of pipe, date of manufacture and the name of the manufacturer. The numbering of the pipe shall be consecutive for each diameter of pipe. Brass lettering templates designed to stencil this information on each pipe shall be provided by the pipe manufacturer. The aforementioned data shall be stenciled on the inside and outside of each length of pipe with waterproof ink or paint. Any pipe arriving at the location of the work without this information stenciled thereon will be rejected. At the end of each day of casting of the pipe, the manufacturer shall forward to the Engineer three copies of a report giving the diameters and the respective numbers of pipe cast that day.

#### D. Monolithic Sewers

1. Forms for monolithic concrete sewers shall be smooth, regular and true to shape. Forms which do not meet these requirements or which result in interior surfaces or thicknesses inferior to commercial precast concrete pipe shall not be used. Forms shall be thoroughly cleaned and approved by the Engineer before re-use. Sheeting shall not be used as exterior forms for monolithic concrete sewers.
2. Concreting, unless otherwise approved by the Engineer, shall proceed in lengths of not less than 12 feet.
3. Construction joints both longitudinal and transverse in monolithic concrete sewers shall have fabricated nickel-copper roofing sheet water stops conforming to the requirements of ASTM B127.

### 2.02 REINFORCED CONCRETE FITTINGS AND SPECIALS

- A. General: Provide reinforced concrete fittings and specials where shown, specified or required, and manufactured in accordance with the applicable sections of the respective standard for the adjoining pipe. Provide joints the same as in the adjoining pipe. Provide the interior surface of bends of the same smoothness and diameter as the adjoining pipe. Provide the centerline radius of curvature of bends to be equal, in dimension, to the inside diameter of the pipe.
- B. Strength: Design all reinforced concrete fittings and specials to have the same strength as the class of the adjoining pipe. Retain a Registered Professional Engineer, licensed in the State of New York to prepare, sign and seal all designs for fittings and specials.
- C. Standard fitting such as bends, tees, wyes and reducers shall be formed of steel, cut, shaped and welded to the proper form. Interior and exterior concrete or mortar shall be placed in approved manner.
- D. Special pieces and openings in standard pipe such as closures, wall fittings, adapters, manholes, air valve outlets, blow-offs and branches shall conform to details approved by the Engineer.

### 2.03 JOINTS

- A. General: Rubber gaskets shall be stored in as cool a location as practicable, preferably at 70 degrees F or less. In no case shall gaskets be exposed to the direct rays of the sun for a total of more than 24 hours.

**B. Gravity Sewer and Drain Lines**

1. Manufacture all gravity sewer and drain pipe, fittings and specials with watertight joints using rubber gaskets in accordance with the requirements of ASTM C443. Provide a preformed groove in the tongue or spigot of sufficient depth to hold the gasket securely in place and produce the proper gasket compression. Reinforced concrete pipe joints shall be optional as to shape, except that no joint shall have a groove in which the wall thickness of the pipe is reduced to less than one-half, other than by a slight draw or taper, unless approved by the Engineer in writing.
2. Manufacture the pipe with perfectly machined castings for forming the bells and spigots so that they will be true circles and when laid together the annular space for the rubber gasket will be perfectly uniform. The diameters of the bell and spigot surfaces, depended upon to compress the gasket, shall not vary from the theoretical diameters by more than 1/16 inch. The joint shall not project beyond the body of the pipe.
3. Reinforce the bells of the pipe with a single cage of steel in which the circumferential members are the same gauge as those in the body of the pipe, but spaced on no more than 1-inch centers.
4. The type and the manufacturer of the flexible rubber gaskets to be used shall be submitted for approval before pipe laying begins.

**2.04 CURING**

- A. Cure all pipe, fittings and specials by steam or membrane curing. Water curing is not permitted.
- B. Cure pipe 28 days prior to laying.

**2.05 SHOP TESTING**

- A. Test concrete sewer pipe in accordance with the applicable provisions of ASTM C497, as required by the ASTM Specification for the pipe and as specified herein.
- B. Test cylinders: Each day the Contractor shall prepare two test cylinders made from the concrete used for manufacturing the pipe under this contract.
  1. Make test cylinders in accordance with the requirements of ASTM C31 and cure and store them under identical conditions with the pipe. Test cylinders shall be properly marked for identification and dated.
  2. The Engineer will have the cylinders tested to determine whether the concrete complies with the strength requirements. Of each pair of test cylinders, one

cylinder will be tested at 7 days, and the other test cylinder will be tested at 28 days.

C. Test Pipe Sections

1. When lengths of pipe are 8 feet or less, the Engineer will select one length from every fifty lengths of each diameter and class.
2. When lengths of pipe are more than 8 feet, the Contractor shall provide a pipe test specimen four feet long for every 50 lengths of each diameter and class. Each test specimen shall be manufactured, marked for identification and shall meet the strength test requirements as specified for the pipe it represents. The manufacturing and marking of the pipe test specimen shall be witnessed by the Engineer.
3. Where less than 50 lengths are required for any pipe diameter, one eight-foot length of pipe will be selected by the Engineer or one pipe test specimen shall be provided for testing purposes; however, the Engineer may waive this requirement at his discretion.
4. Age of Pipe: Pipe selected or pipe tested specimens provided as specified for testing purposes shall be at least twenty-eight days old but shall not be over thirty days old at the time of testing.
  - a. Due to unforeseen conditions beyond the control of the Engineer and the manufacturer, special permission will be given in writing by the Engineer to delay a test beyond the thirty-day aging period.
  - b. The three-edge load bearing strength at 0.01-inch crack and the ultimate load strength of pipe tested after twenty-eight days will be corrected to the twenty-eight day strength by deducting 1/2 of one percent of the recorded strength for each day beyond the twenty-eight day age.
  - c. The Contractor may request tests to be made on pipe which has aged at least fourteen days and not more than 28 days but the tests must meet the 28 day strength test requirement in order to be accepted by the Engineer for installation in the work.

D. Basis of Acceptance: Conform the basis of acceptance for reinforced concrete pipe to Section 5.1.1 of ASTM C76 and this Specification.

1. The Engineer will reject all pipe of the lot which the tested length of pipe represents if the actual or corrected strength of the pipe tested fails to meet the three-edge load bearing strength test requirements. However, if the eight-foot length of pipe selected by the Engineer fails to meet the three-edge loading bearing strength test requirements, the Contractor may request that tests be made on two other eight-foot lengths of pipe representing that lot from which



the original pipe tested was selected. The Engineer will select these two lengths of pipe. Should the tests on these two lengths of pipe prove satisfactory, the lot represented by these lengths of pipe will be accepted. Should the tests on one or two of these lengths of pipe prove unsatisfactory, no further tests on any other lengths of pipe from this lot will be made, and all the pipe in this particular lot will be rejected.

2. The Engineer may accept precast pipe which meets the 0.01-inch crack strength test requirements but does not meet the ultimate load strength test requirements; however, the City will deduct 1/2 of one percent of the price bid per linear foot for that item which covers that particular pipe diameter and test strength requirements, for each one percent by which the ultimate load is below the required ultimate load. This deduction will be made on all pipe represented by the test specimen.
- E. Proof-of-Adequacy Tests for Special Designs: Prior to manufacturing production run pipe of special design, test one pipe of at least four feet in length of each diameter and class by the three-edge-bearing method to confirm that the pipe meets both the 0.01-inch crack and ultimate load requirements for which it is designed.
- F. Joint Adequacy Tests
1. Prior to manufacturing production run pipe, fittings and specials, conduct all tests required by Sections 9 and 10 of ASTM C443 for each diameter of pipe.
  2. Give two weeks' notice in writing, before the day of testing, to both the Engineer and the approved laboratory, to witness the tests. The DSNY reserves the right to have an inspector or authorized representative present at the time of the tests.
  3. All manufacturers supplying reinforced concrete pipe to the DSNY shall, for each size of pipe and gasket combination submitted for approval, have on file with the Department a Certified Statement attested thereto by the City inspector or representative that the hydrostatic test on pipe and on rubber gasket was performed in accordance with the above-mentioned ASTM designation and passed.
- G. Location of Tests: The pipe selected or the pipe test specimen provided for test shall be delivered by the Contractor to an approved testing laboratory and removed by the Contractor after the test has been made. The Contractor may request that tests be made at the manufacturer's plant; however, the pipe manufacturer shall provide an approved and certified testing machine with a hydraulically-operated jack and direct-reading gauges requiring no calibration.
- H. Test Witnessing: Strength tests will be witnessed by the Engineer, if requested.

- I. Costs of Tests: The Contractor shall pay all costs associated with tests and test witnessing.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install all reinforced concrete sewer pipe, fittings and specials in accordance with the manufacturer's recommendations, approved shop drawings and Section 02503 – Installation of Buried Pipelines.

#### 3.02 LEAKAGE TESTS

- A. Test the reinforced concrete sewers for leakage after completion in accordance with Section 02505 – Leakage Tests.

#### 3.03 SCHEDULES

- A. Refer to the schedule contained in the Section 02503 – Installation of Buried Pipelines for information on the piping that is to be constructed using the pipe materials and methods specified herein.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 02503**  
**INSTALLATION OF BURIED PIPELINES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Installation of all underground pipelines as shown on the Contract Drawings. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified. Furnish and install connections, including adapters and closure pieces as required, to connect pipelines to existing pipelines or buried structures.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 02501 - Reinforced Concrete Pipe
- D. Section 02505 - Leakage Tests
- E. Section 03300 - Cast-In-Place Concrete
- F. Section 15051 - Ductile Iron Pipe
- G. Section 15052 - Steel and Stainless Steel Pipe
- H. Section 15141 - Disinfection

**1.03 REFERENCES**

- A. ASTM D 2774 - Practice for Underground Installation of Thermoplastic Pressure Piping
- B. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- C. ASTM C 361 - Specification for Reinforced Concrete Low-Head Pressure Pipe
- D. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile
- E. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800
- F. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges
- G. ASME B31.8 - Gas Transmission and Distribution Systems
- H. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

- I. ASTM A 139 - Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
- J. AWWA C115 - Flanged Ductile-Iron Pipe With Threaded Flanges
- K. AWWA C206 - Field Welding of Steel Water Pipe
- L. ASTM E 165 - Practice for Liquid Penetrant Examination
- M. ASTM E 709 - Practice for Magnetic Particle Examination
- N. New York City Building Code
- O. City of New York Department of Environmental Protection (NYCDEP) Sewer Design Standards
- P. NYCDEP Bureau of Water Supply Standard Water Main Specifications
- Q. NFPA 54 - National Fuel Gas Code

1.04 DESIGN REQUIREMENTS

- A. All reinforced concrete pipe shall conform to the requirements of Section 02501 – Reinforced Concrete Pipe.
- B. All ductile and cast iron pipe and fittings shall conform to the requirements of Section 15051 – Ductile Iron Pipe.
- C. All steel pipe and fittings shall conform to the requirements of Section 15052 – Steel and Stainless Steel Pipe.
- D. Pipeline installations for storm and sanitary drainage shall conform to NYCDEP Sewer Design Standards and NYC Building Code Sections P110.0 – Storm Drainage Piping and P108.0 – Sanitary Drainage Piping, respectively.
- E. Pipeline installations for city water shall conform to NYCDEP Bureau of Water Supply Standard Water Main Specifications and NYC Building Code Section P107.0 – Water Supply and Distribution.
- F. Pipeline installations for natural gas distribution shall conform to NYC Building Code Section P115.0 - Gas Piping and NFPA-54. The complete gas installation including service piping, valves, meters and regulators shall comply with the rules and regulations of the natural gas supplier (Consolidated Edison).

1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.

- B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.
- C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.
  - 1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.
  - 2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.
- D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.
  - 1. Under no condition pass the sling through the pipe.
  - 2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.
  - 3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.
- E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or fittings at the Contractor's expense.
- F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.
  - 1. Obtain approval for the type of blocking and stakes, and the method of installation.
- G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed.
  - 1. Do not use any gaskets showing signs of checking, weathering or other deterioration.
  - 2. Do not use gasket material stored in excess of six months without approval.

#### 1.06 FIELD CONDITIONS

- A. Repair of Existing Piping to be Maintained: Rebed, in compacted select fill material, existing pipes which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.
2. Provide pipe for reconstruction of existing pipe meeting the appropriate specification requirements.
3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1 and the Buried Piping Schedule.
  1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.
- B. Earthwork: The Contractor shall perform all earthwork including excavation, backfill, dewatering, bedding, compaction, shoring and bracing, grading, and restoration of surfaces, and seeded areas disturbed under his contract in accordance with Division 2 – Site Construction.
- C. Pipe Laying - General
  1. Proper and suitable tools and appliances for the safe, convenient handling and laying of pipe shall be used and shall agree with manufacturer's recommendations. At the time of laying, the pipe shall be examined carefully for defects, and should any pipe be discovered to be defective after being laid, it shall be removed and replaced with sound pipe.
  2. For pipelines intended for gravity flow, begin pipeline laying at the low end of a run and proceed upgrade.
  3. Generally, lay all pipe with bells pointing ahead.
  4. Carefully place each pipe and check for alignment and grade.
  5. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.
  6. Wedging or blocking up the pipe barrel shall not be permitted.

7. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.
8. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.
9. Keep all lines absolutely clean during construction.
10. Lay pipelines accurately to line and grade. The interior surface shall be smooth and uniform.
11. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.
12. Close off all lines with bulkheads when pipe laying is not in progress.
13. Furnish and install connections, including adapters and closure pieces as required, to connect pipelines to existing pipelines or pipelines provided under the Plumbing Contract.

D. Pipe Laying - Trenches

1. Trench excavation and backfill shall be performed as specified in Section 02316 - Excavation and Section 02317 - Backfill.
2. Lay all pipelines in trench excavations on select fill bedding, Class 25 concrete cradle or other foundations as shown, specified or ordered in writing.
3. Properly secure the pipe against movement and make the pipe joints in the excavation as required.
4. Carefully grade and compact pipe bedding.
5. Bell Holes
  - a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.
  - b. Thoroughly tamp bell holes full of select fill material following the making of each joint.
6. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.
  - a. Where groundwater is encountered, make every effort to obtain a dry trench bottom.



- b. If a dry trench bottom has not been obtained despite the use of all known methods of trench dewatering, then excavate below grade and place sufficient select fill material, crushed stone, or Class D concrete over the trench bottom.
- E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.
- F. Jointing Concrete Pipe with Rubber Gaskets
  - 1. Preparation of Joint Surfaces: Before joining concrete pipe using flexible rubber gaskets, wipe clean the joint surfaces of both the bell and spigot ends. Repair any lumps, projections, burrs, or chips which would interfere with the proper compression of the gasket.
  - 2. In making O-ring rubber gasketed joints, lubricate the gasket and the pipe socket with an approved rubber gasket lubricant, and stretch the gasket over the spigot and place gasket accurately in position.
  - 3. The position and condition of the gasket shall be examined from the inside of the pipe before successive pipe lengths are installed. If an unsatisfactory condition is located, the pipe shall be taken out and the operation of drawing the pipe together repeated with a new gasket.
  - 4. Carefully center the spigot end in the socket of the preceding pipe to avoid displacement of the gasket and draw the pipe home fully compressing the gasket with an approved tackle and apparatus. Prior to the use of such apparatus and method, demonstrate to the Engineer for approval the effectiveness and practicability of the proposed method of drawing the joints home.
  - 5. Make adjustments to line and grade in such a manner that the compressed rubber gasket will not be disturbed.
  - 6. Curve Offset: Construct curves for reinforced concrete pipelines with standard pipe where the opening of the joint on the outside of the curve is less than 1/2 inch.
  - 7. Curve Fittings: Where greater opening of the joint would be required, construct curves using beveled or radius pipe with standard joints, short lengths of pipe, or plain end radius pipe with cast concrete collar joints, or continuous concrete encasement; or by monolithic construction.

## G. Jointing Concrete Pipe at Structures

1. At manholes and other structures in precast concrete pipelines, the construction may be of monolithic concrete. Submit details of such joints to the Engineer for approval.
2. Where provisions for future connections are required, provide similar joints and coat with an approved asphaltic compound for protection. If necessary, in the opinion of the Engineer, place a suitable collar entirely around the pipe at all such joints.

## H. Concrete Pipeline Joint Finishing: Provide the following finished joints for steel end ring concrete pipelines with rubber gaskets:

1. Exterior Joint Grouting:
  - a. Grout joints for concrete pipelines using rubber gaskets and steel end rings on the outside with cement mortar composed of 1 part Type II portland cement to 1 part sand by volume.
  - b. Thoroughly mix the materials to produce a uniform mortar with all aggregate particles well coated.
  - c. In grouting the exterior joint, use a cloth diaper to encase the outside diameter of the bell of the pipe and adequately straddle the joint recess to keep out dirt and to serve as a form for grouting.
  - d. Fill the joint space with cement mortar which is just thin enough to run around the joint.
  - e. Leave the diaper in place permanently.
  - f. Before the mortar has taken its initial set, examine the diaper, and if not completely filled, force additional mortar into the joint.
2. Interior Joint Grouting
  - a. Place cement grout in the interior annular joint opening of all steel end ring concrete pipe for pipe sizes 30 inches and larger in diameter.
  - b. Perform interior joint grouting in two phases.
    - (1) Immediately following pipe laying.
    - (2) After backfilling the entire pipeline is complete.

3. Joints for Concrete Pipelines with all-concrete pipe ends:
  - a. Do not grout joints on the outside of the joint for concrete pipelines using rubber gaskets with all-concrete pipe ends.
  - b. Fill the interior annular joint opening with cement mortar and trowel smooth for all pipe 30 inches and larger.
4. Alternative to Grouting
  - a. In place of grouting, use a joint filler consisting of a preformed loop of urethane foam impregnated with unhydrated Portland cement to fill the outside joint recess in prestressed lined cylinder pipe.
  - b. Place the loop, sized to fit the spigot end of the pipe, around the spigot ring behind the gasket groove.
  - c. Draw the pipe joined as described herein home, compressing the rubber gasket and forcing the urethane foam loop to fill the outside annular joint recess.

I. Ductile Iron Pipe Mechanical Joints

1. Assembly: In making up mechanical joints, center the spigot in the bell.
  - a. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint.
  - b. Brush lubricant over the gasket just prior to installation.
  - c. Place the gasket and gland in position, bolts inserted, and the nuts tightened fingertight.
  - d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly.
  - e. Prime all bolts by dipping with a bituminous coating, except the threads. Coat threads immediately prior to installation of nuts.

2. Torques: Apply the following range of bolt torques:

<u>Size Inches</u>	<u>Range of Torque - ft. lbs</u>
5/8	45 - 60
3/4	75 - 90
1	85 - 100
1-1/4	105 - 120

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

J. Ductile Iron Pipe Rubber Gasket Joints

1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.
  - a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.
  - b. Apply a thin film of lubricant to the inside surface of the gasket that will come in contact with the entering pipe.
  - c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.
  - d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.
2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.
  - a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.
  - b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.

**K. Steel Pipe Bell and Spigot Rubber Gasket Joints**

1. Assembly: Thoroughly clean the joint surfaces of both the bell and spigot ends before jointing steel pipe with bell and spigot rubber gasket joints.
  - a. Stretch a clean rubber gasket, lubricated with an approved rubber gasket lubricant, over the spigot and place accurately in position in the spigot groove.
  - b. After the gasket is placed in the spigot groove, adjust the gasket so the tension in the rubber is uniform around the circumference of the joint.
  - c. Clean and lubricate the joint surface of the bell end.
  - d. Center the spigot end in the bell, being careful to avoid dragging the spigot or displacing the gasket, and draw the pipe home, fully compressing the gasket.
  - e. Assemble the joint with the longitudinal axis of the pipe lengths in straight alignment. Deflect joints to make adjustments to line and grade after the joint has been completely assembled. Do not disturb the compressed rubber gasket when deflecting joints.
2. Positioning: Prior to backfilling, feel completely around the joint using a feeler gauge to determine whether the gasket is in its proper position.
  - a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.
  - b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.

**L. Steel Pipe Field Welded Lap Joints:** Perform all welding and testing of welded in accordance with the requirements of Section 15052 – Steel and Stainless Steel Pipe.

**M. Ductile Iron Pipe and Steel Pipe Joint Lining:** For cement mortar lined ductile iron pipe greater than 30 inches in diameter, fill all interior joint recesses with mortar and make recesses smooth and flush with adjacent pipe interior walls in accordance with AWWA C205, Appendix A.2. For cement mortar lined steel pipe 8 inches in diameter and larger, except sleeve type coupling joints, fill all interior joint recesses with mortar and make recesses smooth and flush with adjacent pipe interior walls in accordance with AWWA C205, Appendix A.2. Use Type II portland cement in mortar for interior joint finishing of wastewater pipelines.

N. Water Main Connections

1. Arrange connections to existing city water mains with the NYCDEP Bureau of Water and Sewer Operations.
2. Provide connections of size and in locations as indicated on the Contract Drawings.
3. The cuts in the mains for services requiring wet connections will be made by the NYCDEP or will be performed under the supervision of the NYCDEP. All other work, including the setting of the wet connection sleeves and valves, shall be done by the Contractor.
4. Provide connections and materials meeting the requirement of the NYCDEP Bureau of Water Supply Standard Water Main Specifications.

O. Connections to Existing Sewers and Manholes

1. Arrange connections to existing city sewers and manholes with the NYCDEP Bureau of Water and Sewer Operations.
2. Provide connections of size and in locations as indicated on the Contract Drawings.
3. Provide connections and materials meeting the requirements of the NYCDEP

P. Gas Main Connections

1. Arrange for connection to gas mains with the natural gas supplier (Consolidated Edison).
2. The natural gas supplier will install service piping from the nearest gas main to up to the main service shut-off valve. Installation of the remaining gas piping, including the gas regulator assembly, will be the responsibility of the Contractor. The gas meter will be installed and activated by the natural gas supplier once the natural gas piping has been tested and accepted.
3. Comply with NYC Building Code, NFPA 54, and all rules and regulations of the natural gas supplier.

Q. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.
- R. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.
1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.
- S. Concrete Cradle
1. General: When a concrete cradle is shown, specified, or ordered in writing, lay the pipe to grade by supporting each section on concrete blocks located near each end.
    - a. Shape the tops of the blocks to fit the outside diameter of the pipe.
    - b. Set the blocks approximately 3/8 inch low.
    - c. Place the pipe on the blocks on a layer of stiff mortar of sufficient thickness to bring the pipes to exact grade.
    - d. Timber blocking, of a type approved, may be employed in place of concrete blocks.
  2. Cradle: Place Class 25 concrete cradle, on one side only, until it has risen above the invert on the other side, after which deposit the remainder of the concrete on both sides to the pipe spring line.
    - a. Prevent movement of the pipe during concrete placement.
    - b. Conform concrete to Section 03300 – Cast-In-Place Concrete
  3. Backfill: Placing of the pipe on supports or cradles under the pipe does not relieve the Contractor from the work of providing a firm and continuous bed for the pipe by compacting select fill bedding under and around the pipe and between the cradles.
- T. Concrete Encasement: When concrete encasement is to be provided, as shown, specified, or ordered in writing, lay and block the pipeline and place concrete as specified for concrete cradle.
1. Continue the placing of concrete to provide complete encasement to the dimensions shown, specified, or ordered.
  2. Conform concrete to Section 03300 – Cast-In-Place Concrete.

- U. Coatings and Linings: Provide coatings and linings as specified on the Buried Pipe Schedule in this section and in accordance with the requirements of Section 15051 – Ductile Iron Pipe, Section 15052 - Steel and Stainless Steel Pipe.
- V. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.
  - 1. Satisfactorily reset any valve box which is moved from its original position, preventing the operation of the extension valve stem.
  - 2. Replace any extension valve stem which has been damaged so that it can be operated.
  - 3. Install new valve boxes in accordance with NYCDEP Bureau of Water Supply Standard Water Main Specifications.
- W. Jacking
  - 1. General: Perform jacking as shown. After jacking is completed, seal the ends of the casing pipe with brick masonry.
  - 2. Jacking Pit: Provide jacking pit of adequate length to provide room for the jacking frame, the jacking head, reaction block, the jacks, rig, and jacking pipe.
    - a. Construct the pit to be sufficiently wide to allow ample working space on each side of the jacking frame and sufficiently deep so that the invert of the pipe will be at the elevation desired for the completed line when placed on the guide frame.
    - b. Tightly sheet the pit and keep it dry at all times.
    - c. Provide adequate protective railings at the top of the pit at all times.
  - 3. Jacking Frame: Design the jacking frame so that it applies a uniform pressure over the entire pipe wall area of the pipe to be jacked.
  - 4. Reaction Blocks: Adequately design the reaction blocks to carry the thrust of the jacks to the soil without excessive soil deflection in a manner which avoids any disturbance of adjacent structures or utilities.
  - 5. Hydraulic Jacks: Use hydraulic jacks in the jacking operation, and take extreme care to hold the casing pipe to exact line and grade.
  - 6. Advance Excavation: Advance excavation by augering.



7. Casing Pipe: Furnish steel casing pipe, unless otherwise specified, conforming to ASTM A 139 with wall thicknesses and pipe diameters shown on the Plans. Provide full penetration butt welded pipe joints.
8. Fill Material: Use fill material, consisting of 1-1/4 pounds of Bentonite per gallon of water, during jacking to fill any voids between the casing pipe and the earth.

X. Erection

1. Anchorage: Place anchorage of pipelines and appurtenances as shown or as ordered.
  - a. Accomplish anchorage by placing concrete to the dimensions shown between undisturbed earth and the fitting to be anchored.
2. Valve Setting: Erect valves carefully in their proper positions, free from all distortion and strain, with flanged, mechanical or push-on joints, and pack and leave in satisfactory operating condition.
3. Short Tunnel Construction: Joint pipes to be placed in short tunnels prior to being placed into position.
  - a. Place the pipe into position in a manner which keeps joints tight.

- Y. Restoration and Temporary Pavement Work: All restoration and temporary pavement work shall be completed within 30 working days after the installation of underground piping is completed.

3.02 FIELD QUALITY CONTROL

- A. Testing: Test pipelines in accordance with Section 02505 – Leakage Tests.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.

B. Pressure Testing for Natural Gas Piping

1. The natural gas supplier requires an inspection of prior to trench backfill of any below-grade customer-owned gas piping that meets the definition of a gas service, such as piping from a remote meter location to the building. Contractor shall notify the supplier at least 48 hours prior to the time the piping is expected to be ready for this inspection.
2. For below-grade customer owned gas piping installations, the Contractor must perform an acceptance test to verify the conditions of the cathodic protection measures installed. This test, which shall be performed after the installation of the pipe and prior to the setting of the meter, only indicates the

condition of the cathodic protection at the time of testing. Any corrective action required by virtue of test results shall be the contractor's responsibility. The natural gas supplier reserves the right to perform a cathodic protection acceptance test on any given installation.

3. All piping shall be pressure tested according to the requirements of the natural gas supplier, New York City Building Code, and NFPA 54.
  4. The Contractor shall notify the office of the New York City Fire Marshall of all field tests of natural gas piping 15 days prior to the date of testing. The Fire Marshall shall witness all testing.
  5. The gas meter will not be installed and the service will not be activated until the natural gas supplier has accepted the installation.
- C. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.
1. Cut away any lumps or projections on the face of the spigot end or the shoulder.
  2. Do not use any cracked, broken, or defective pieces in the work.
  3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

### 3.03 CLEANING

- A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.
- B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

### 3.04 DISINFECTION

- A. Disinfect all pipelines that are to carry potable water in accordance with Section 15141 - Disinfection.

## 3.05 SCHEDULE

## A. Definitions: Abbreviations used in the schedule are:

## 1. Pipe Materials

a.	Al	Aluminum
b.	Br	Brass
c.	C	Concrete
d.	CPVC	Chlorinated Polyvinyl Chloride
e.	CU	Copper
f.	DI	Ductile Iron
g.	PCCP	Prestressed Concrete Cylinder Pipe
h.	PE	Polyethylene
i.	PVC	Polyvinyl Chloride
j.	RCP	Reinforced Concrete Pipe
k.	RCPP	Reinforced Concrete Pressure Pipe
l.	SS	Stainless Steel
m.	St	Steel

## 2. Joints

a.	B	Bituminous
b.	B&S	Bell and Spigot
c.	F	Flanged
d.	G	Grooved End
e.	H	Harnessed
f.	HSC	Hub and Spigot - Compression Gasket
g.	MJ	Mechanical Joint
h.	PO	Push-on Joint
i.	RPOJ	Restrained Push-on Joint
j.	RRG	Restrained Retainer Gland
k.	RS	Rubber and Steel
l.	Sd	Soldered
m.	Sl	Sleeve Type Coupling
n.	SW	Solvent Welded
o.	Thd	Threaded
p.	W	Welded

## 3. Coatings and Linings

a.	BC	Bituminous - Cold Application
b.	CE	Concrete Encased
c.	CL	Cement-Mortar Lined
d.	E	Epoxy
e.	G	Galvanized
f.	GL	Glass Lined
g.	I	Insulated

h.	KL	Polyvinylidene Fluoride (PVDF or KYNAR®)
i.	P	Painted
j.	PEW	Polyethylene Wrapped
k.	PPL	Polypropylene Lined
l.	RC	Rubber Coated
m.	RL	Rubber Lined
n.	SL	Polyvinylidene Chloride (PVDC or SARAN ®)
o.	TC	Tape Coated
p.	W	Wrapped

B. Schedule: Provide products as listed in the following schedule:

-END OF SECTION-

BURIED PIPING SCHEDULE								
Service	Size (inches)	Pipe Material	Protective Coatings		Joints	Test Pressure (psig)	Pipe Class/ Wall Thickness/ Schedule	Remarks
			Interior	Exterior				
City Water, Siamese and Fire Protection	4 to 10	DI	CL	PEW	RPOJ	150	56	
Storm and Sanitary Sewer	12 to 30	RCP	--	--	B&S	--	V	See Note 2
	6 to 10	DI	CL	PEW	RPOJ	--	56	See Note 2
Sanitary Sewer Force Main	4 to 12	DI	CL	PEW	RPOJ	150	56	
Natural Gas	1.5 to 4	ST	--	W/TC	W	95	Sch 40	See Note 4
Diesel Fuel Piping	2/4	304LSS/ FRP	--	--	WLD/SW	150	Sch 50	See Note 5
Vapor Return Piping	2/4	304LSS/ FRP	--	--	WLD/SW	150	Sch 50	See Note 5

## Notes:

1. Encase all piping below concrete structures with concrete. Provide concrete encasement where shown on Contract Drawings. No exterior coating is required on portion of pipe encased in concrete.
2. Pressure and leakage testing requirements and procedures are specified in Section 02505 - Leakage Tests.
3. All connections to valves and equipment shall be made with flanged joints.
4. Install and test natural gas piping in accordance with NYC Building Code, NFPA 54, and all rules and regulations of the natural gas supplier.
5. Diesel fuel and vapor return piping shall be double wall containment piping with 2 inch type 304 L stainless steel carrier and 4 inch FRP containment pipe as specified in Section 15191 - Diesel Fuel Piping. Diesel fuel piping shall also be incased in concrete when passing through the building. No other pipe lines shall be incased in the same concrete encasement.

**Section 02504**  
**SANITARY AND STORM SEWER STRUCTURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for furnishing and installing precast and cast-in-place concrete drainage structures including, but are not limited to: manholes, inlets, catch basins, trench drains, area drains, pipe cradles and encasements, splash pads and other structures in sanitary sewers and storm sewers including all appurtenances. Section also includes requirements for fiberglass trench drains and appurtenances.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 02316 - Excavation
- C. Section 02317 - Backfilling
- D. Section 03200 - Concrete Reinforcement
- E. Section 03300 - Cast-in-Place Concrete
- F. Section 02505 - Leakage Tests
- G. Section 05561 - Miscellaneous Metal Castings

**1.03 REFERENCES**

- A. ASTM C32 - Sewer and Manhole Brick (Made for Clay or Shale)
- B. ASTM C39 - Compressive Strength for Cylindrical Concrete Specimens
- C. ASTM C78 - Flexural Strength of Concrete
- D. ASTM C139 - Concrete Masonry Units for Construction of Catch Basins and Manholes
- E. ASTM C140 - Methods of Sampling and Testing Concrete Masonry Units
- F. ASTM C144 - Aggregate for Masonry Mortar
- G. ASTM C279 - Chemical-Resistant Masonry Units
- H. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric)
- I. ASTM C478 - Precast Reinforced Concrete Manhole Sections
- J. ASTM C666 - Freeze Thaw Stability of Concrete Specimens

- K. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
- L. AWWA C302 - Reinforced Concrete Pressure Pipe, Non-Cylinder Type
- M. New York City Department of Environmental Protection (NYCDEP) Sewer Design Standards

#### 1.04 DESIGN REQUIREMENTS

- A. Except as otherwise shown or specified, construct sewer manholes and catch basins of precast reinforced concrete sections conforming to ASTM C478.
- B. Unless otherwise shown, manholes and catch basins shall be built in accordance with the Sewer Design Standards of the NYCDEP, except that they shall be constructed without steps.
- C. Trench drains shall be constructed of precast, interlocking modular components.
- D. Fiberglass trench drains shall be constructed of resin vinylester suitable for 15% sodium hypochlorite at 100°F with a resin of Hetron 922 or approved equal.

#### 1.05 SUBMITTALS

- A. Contractor shall submit working drawings and material specifications for the approval of the Engineer in accordance with the requirements of Section 01330 – Shop Drawings.
- B. Contractor shall submit shop and field test reports of concrete samples tested in an approved laboratory.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Take every precaution to prevent injury to the structures during transportation and unloading. Unload manhole sections and other precast items using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and keep the items under control at all times. Do not allow the items to be dropped, dumped or dragged under any conditions.
- B. Damaged Section: If any precast manhole section or other structural unit is damaged in the process of transportation or handling, reject and immediately remove the item from the site, and replace it at no increase in Contract Amount.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

#### A. Precast Manholes

1. Monarch Precast Concrete Corp.
2. Precast Concrete Sales Company
3. Long Island Precast, Inc.
4. Or approved equal

#### B. Precast Inlets

1. Monarch Precast Concrete Corp.
2. Rotondo/Penn-Cast Products, Inc.
3. Precast Concrete Sales Company
4. Or approved equal

#### C. Precast Catch Basins

1. Monarch Precast Concrete Corp.
2. Rotondo/Penn-Cast Products, Inc.
3. Long Island Precast, Inc.
4. Precast Concrete Sales Company
5. Or approved equal

#### D. Polymer Concrete Trench Drains

1. ABT, Inc.
2. ACO Polymer Products, Inc.
3. Or approved equal

#### E. Fiberglass Trench Drains

1. ACO Polymer Products, Inc.
2. Aquaduct, Inc., Monroe, NC
3. Or approved equal

### 2.02 MATERIALS

- A. Concrete, Steel Reinforcement and Aggregates: For precast manholes, catch basins, inlets, and other sanitary and storm sewer structures, reinforced concrete, cementitious materials, aggregates and steel reinforcement shall conform to the requirements of ASTM C478. If concrete rings are used for adjusting manhole frames to grade, they shall conform to the requirements of ASTM C139. For cast-in-place structures, these materials shall conform to Section 03200 – Concrete Reinforcement and Section 03300 – Cast-In-Place Concrete.



- B. Brick: If brick is used for adjusting manhole and catch basin frames to grade, it shall conform to ASTM C32, Grade MS, with minimum dimensions of 2¼ by 3½ by 7½ inches. Brick shall be new, solid, sound, hard burned throughout and uniform in size and quality.
- C. Mortar: Provide mortar that is composed of one part Type II Portland cement or Portland pozzolan cement to two parts sand. Sand shall be natural sand that conforms to the requirements of ASTM C144.
- D. Frames and Covers: Frames, covers, gratings and miscellaneous metal castings shown in the NYCDEP Sewer Design Standards or on the Contract Drawings for installation on manholes, catch basins, trench drains and other sanitary structures shall be gray iron and shall meet the requirements of Section 05561 – Miscellaneous Metal Castings. Grating for trench drains shall be compatible with the trench drain manufacturer's systems and recommendations.
- E. O-Ring Rubber Gaskets: Provide O-ring rubber gaskets conforming to ASTM C443 for joining manhole sections.
- F. Pipe Connections: Provide resilient connectors conforming to ASTM C923 for making connections between manholes and sewer pipes.
- G. Polymer Concrete Trench Drains
1. The trench drain shall be formed from high strength, durable polymer concrete, meeting or exceeding the following requirements:

Property	ASTM Designation	Polymer Concrete
Compressive Strength	C39	14,000 psi
Tensile Strength	C78	1,500 psi
Freeze Thaw	C666	1,700 cycles (no weight loss)
Chemical Resistance	C279	Resistant to most acids and alkali
Absorption of Moisture	C140	Less than 0.2 (surface wetting only)

2. Sealant for Polymer Concrete Trench Drains. Joints between channel sections shall be sealed during installation with a material recommended by manufacturer.

H. Fiberglass Trench Drains

1. Fiberglass trench drains shall be manufactured from fiberglass reinforced plastic utilizing vinylester. FRP fabrication shall be of the hand lay-up type.

The trench drain systems utilizing polymer resins with aggregate or sand are not acceptable. To reduce air entrapment, no pigment shall be used on the resin system. A double synthetic veil shall be provided on the inner trench surfaces and an ultraviolet inhibitor shall be provided. Cobalt compounds shall not be used in any way.

2. The trench drains shall have a built-in slope of not less than 1%, and shall be furnished in modular lengths of 6 feet. Modules shall have a bottom radius of not less than 2 inches expanding to a nominal inlet opening of 8 inches. Modules shall be joined together with a lap joint not less than 2 inches to provide a positive seal, and joint shall be designed so as to minimize disturbance of flow. Joints between channel sections shall be sealed during installation with a material recommended by manufacturer.
  3. Channel modules shall incorporate flanges predrilled to accept the appropriate grate frame, as specified. Frames shall be of all welded construction with welded stainless steel concrete anchors and threaded for grate lockdown.
  4. Written certification from the manufacturer is required for each of the specified materials and fabrication techniques.
- I. Trench Drain Inlet and Outlets. Size and arrangement shall be as shown on Contract Drawings.

## 2.03 CONSTRUCTION OF MANHOLES

- A. Manhole Base Section: Unless otherwise shown, provide manhole base sections consisting of a base riser section with an integral floor. When benches are made at the manufacturing site, provide concrete used for benched inverts conforming to the requirements for concrete used for precast sections. When benches are made in the field, Class 45 concrete may be used. Benches shall be float finished and sloped to drain.
- B. O-ring Joints: Join riser, cone and flat slab top sections with O-ring rubber gasket joints or self-sealing butyl gaskets, as shown in the NYCDEP Sewer Design Standards. Fill voids in the joints completely with mortar after assembly of the sections.

## 2.04 SOURCE QUALITY CONTROL

- A. Concrete Strength: Manhole sections will be inspected and tested by an independent, certified testing laboratory, retained by the Construction Manager, to establish the strength of the concrete and the adequacy of curing, to certify the date that the sections were cast and to confirm that the reinforcing steel has been properly placed. This inspection and testing will be performed by the laboratory at the manufacturing plant prior to shipment.

1. A minimum of one set of three cylinders will be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each 9 cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.
  2. The City reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.
- B. Acceptance of flat slab tops will be based on the tops passing a proof-of-design test in accordance with ASTM C478. One flat slab top for each design shall be tested.

## 2.05 PRECAST PRODUCTS

- A. Unless otherwise shown or specified, precast concrete products shall be used for sanitary and storm sewer structures.
- B. The number of joints in manhole and catch basin riser sections shall be kept to a minimum by using sections 8'-0" long in so far as possible. Joints shall be tongue and groove type conforming to AWWA C302, with continuous steel reinforcement in the tongue and bell.
- C. Wet-cast methods only shall be used. Forms shall leave the surfaces smooth and free of irregularities or honeycombing.
- D. Unless otherwise shown or specified, the following design loadings shall be used with 30 percent impact allowance in roads and 15 percent elsewhere.
1. Earth = 130 PC
  2. Wheel = H-20
- E. Unless otherwise shown or specified, wall thickness for manholes and catch basins shall be not less than:
1. 5 inches for walls
  2. 8 inches for top slab
- F. No more than two (2) tapered lifting holes shall be provided per section of manhole or lifting holes shall be filled with tapered rubber plugs.

- G. The point of intersection (P.I.) of pipes shall be marked with a pin in the manhole floor.
- H. The date of manufacture and the manufacturer's trademark shall be marked inside each manhole and catch basin barrel.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Excavation and Backfill: Perform excavation and backfill in accordance with Section 02316 – Excavation and Section 02317 - Backfilling.
- B. Precast Items
  - 1. Place structure on select fill bed or concrete pile cap and set level as shown:
    - a. Where pile supports are required, set structure on the pile cap as shown on the Contract Drawings.
    - b. Where pile supports are not required, set on six inches of compacted select fill in accordance with Section 02317 – Backfilling.
  - 2. Backfill the area that is excavated adjacent to the structure and under the pipe with select fill to prevent settlement and provide for support for the pipe from the manhole edge to the regular trench excavation.
  - 3. Place backfill in even lifts on all sides to prevent overturning loads.
  - 4. Set structures at the proper grade and alignment to provide a smooth transition from the incoming pipe(s) to the outgoing pipe.
- C. Connections to Sewers: Provide connections to sewer pipes in accordance with NYCDEP Sewer Design Standards:
  - 1. Manufacture riser sections with openings properly located for making connections to sewers. The minimum distance between a joint in a manhole section and the nearest edge of an opening for a connecting sewer and the diameter of such openings shall be as shown in the NYCDEP Sewer Design Standards.
  - 2. Provide a connection between the structure and the pipe that is watertight and an invert that is smooth and continuous as it enters and exits the manhole. Sewer pipe shall not protrude into the trough of the manhole.
  - 3. Join inlet and outlet pipes to the structure with a flexible watertight connection. Seal pipe in the structure openings with a resilient connector

meeting the requirements of ASTM C923. Resilient connector shall be cast integrally into the wall of the manhole section at time of manufacture, or, shall be installed by mechanical means in openings cut into manhole wall per ASTM C 923.

D. Coatings: Precast structures below grade shall be coated with coal tar epoxy applied in two (2) coats, eight (8) mils each.

E. Laying Masonry

1. Bricks shall be wetted before applying mortar.
2. Full bed, end and side joints shall be formed in one operation.
3. Horizontal joints shall be 3/8 inch maximum and radial joints shall be 1/4 inch maximum.
4. Keyways shall be completely filled with mortar.
5. The total amount of adjustment by bricks or concrete rings shall not exceed 12 inches.

F. Stubs for Future Connections: Where shown, provide stubs or bells cast in walls and provide approved plugs or caps.

G. Trench Drains: Follow manufacturer's recommendations for installation methods. Forming system for fiberglass trench drains shall be designed so that no portion of fiberglass form is exposed to traffic upon completion of installation.

H. Grading

1. Manholes and catch basins shall be installed such that covers will be at final grade.
2. Structures shall not project above finished pavements.
3. Structures in areas with temporary working grades shall be initially installed to match the temporary grade, and adjusted later to final grade prior to regrading.
4. Contractor shall be responsible for setting structures to the proper grade. The Engineer's review will be general and will apply to components only.

### 3.02 LEAKAGE TESTS

A. Test the structures for leakage after installation in accordance with Section 02505 – Leakage Tests.

3.03 MANUFACTURER'S SERVICES

- A. The Contractor shall furnish the services of an accredited representative of the fiberglass trench drain system manufacturer for a period of 2 days to supervise the installation.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 02505**  
**LEAKAGE TESTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Leakage testing for all pipelines and structures required to be watertight or airtight.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 15120 - Interior and Exposed Piping Schedule
- C. Section 02503 - Installation of Buried Pipelines

**1.03 REFERENCES**

- A. ACI 350.1R - Testing Reinforced Concrete Structures for Watertightness
- B. ASTM C361 - Reinforced Concrete Low-Head Pressure Pipe
- C. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- D. New York City Building Code
- E. New York City Department of Environmental Protection (NYCDEP), Bureau of Water Supply Standard Water Main Specifications

**1.04 PERFORMANCE REQUIREMENTS**

- A. Written Notification of Testing: Provide written notice at least two weeks prior to date of testing.
- B. No tests shall be conducted without an approved written procedure.
- C. All leakage tests shall be conducted in the presence of the Engineer. The tests shall be repeated in the presence of local authorities having jurisdiction if required by them.
- D. The Contractor shall furnish all labor, equipment, air, water and materials, including meters, gauges, blower, pumps, compressors, fuel, water, bulkheads, temporary weirs, valves, plugs and accessory equipment.



## 1.05 SUBMITTALS

- A. All submittals, including the following, shall be provided as specified in Section 01330 – Shop Drawings.
- B. Testing procedures shall be submitted for approval at least 30 days prior to the test.
- C. Testing Report: Prior to placing the piping system or structure in service, submit for review and approval a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

## 3.01 GENERAL

- A. All pipelines and structures required to be watertight or airtight shall be tested for leakage. Piping and structures which fail the leakage test shall be repaired or replaced to the satisfaction of the Engineer and retested until leakage test results are acceptable.
- B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities or other contractors working on the site.
- C. Test gravity sewers and drain lines by an Infiltration Test as specified.
- D. Test air and gas lines with compressed air.
- E. Test water mains with water under the specified pressure and in accordance with NYCDEP Standard Water Main Specifications.
- F. Test all other pipelines with water under the specified pressures.
- G. Test vents and drains in plumbing systems and all cast iron soil pipe lines in accordance with Section C26-1606.0 of the New York City Building Code unless otherwise specified. Unless specified otherwise, test all vents and drains on process piping as for plumbing systems.
- H. Leakage in pipelines of other than circular section shall not exceed an amount based on a circular section having an equivalent inner perimeter.

### 3.02 PRESSURE TESTS OF EXPOSED PIPING

- A. Testing: Pressure test exposed pipelines for leakage by maintaining the fluid in the pipe at the specified pressure for a period of 60 minutes. Examine all accessible joints during the test. Stop all visible leakage and provide repairs as specified in 3.06 – Repair of Leaking Pipes.
- B. Test Pressures: Test the various pipelines at the test pressures specified in Section 02503 - Installation of Buried Pipelines and Section 15120 – Interior and Exposed Piping Schedule.
- C. Backfill: Do not backfill the trench until all visible leaks or other defects have been repaired to the satisfaction of the Engineer.

### 3.03 PRESSURE TESTS OF BURIED OR CONCEALED DUCTILE-IRON PIPELINES AND FORCE MAINS

- A. Testing
  - 1. Completely backfill all harnessed sections of buried piping before such sections are tested. Non-harnessed sections of buried piping shall be tested before backfilling.
  - 2. Pressure test buried or concealed pipelines for leakage by maintaining the fluid in the pipe at the specified pressure for a minimum period of 4 hours.
  - 3. Pressure test the piping for leakage as a whole or in sections, valved or bulkheaded at the ends. Apply the specified pressure to the piping through a tap in the pipe by means of a hand pump or other approved method. Do not use air for testing.
  - 4. Test the piping at the test pressures specified in Section 02503 – Installation of Buried Pipelines.
- B. Allowable Leakage: Stop all visible leakage. Do not allow leakage for any piping, as determined by the above test, to exceed the allowable leakage for ductile iron water mains as given by the following formula in Section 4 of AWWA C600 in which L is the allowable leakage in gallons per hour, S is the length of water main tested in feet, D is the nominal diameter of the pipe in inches and P is the average test pressure in psi gauge:

$$L = \frac{S \times D \times (P)^{1/2}}{133,200}$$

### 3.04 VALVE TESTING

- A. Testing: Operate valves in the section under test through several complete cycles of closing and opening. In addition, have the test pressure for each valve, when in the closed position, applied to one side of the valve only. Test each end of the valve in this manner.
- B. Test Pressure: Test each valve at the same test pressure as that specified for the pipe in which the valve is installed.
- C. Leakage: Stop all external and internal leakage through the valves.
- D. Movement: Stop all valve movement or structural distress.

### 3.05 LEAKAGE TESTS FOR GRAVITY SEWERS

- A. Submerged Testing Procedure: When the groundwater level is above the sewer, test sewers for infiltration as follows:
  - 1. Measure the infiltrated flow of water by means of a weir set up in the invert of the sewer at a known distance from a temporary bulkhead or other limiting point of infiltration.
  - 2. Test after the sewer or sewers have been pumped out, if necessary.
  - 3. Do not start testing until normal infiltration conditions are established in the work to be tested.
    - a. Inspect gravity sewer visually for infiltration.
    - b. Pump the sewers dry and make sure the groundwater level is above the crown of the sewer.
    - c. Inspect the sewer on the inside and seal all visible leaks completely.
- B. Non-Submerged Testing Procedure: If the groundwater level is below the top of the sewer, test for leakage as follows:
  - 1. Construct a bulkhead in the sewer at the manhole at the lower end of the section under test.
  - 2. Fill the section being tested with water until the level of water is four feet above the crown of the sewer in the manhole at the upper end of the test section. For concrete sewers, allow the water to remain in the piping for at least 12 hours before conducting the tests.

3. Leakage will be the measured amount of water added to maintain the water at that level.
- C. Carry on tests for a minimum of eight hours with readings at 60-minute intervals.
- D. In computing the length of sewer contributing infiltration or leakage, include the length of house connections tested, if any, in the total length.
- E. The quantity of infiltration or leakage for sewers shall not exceed 200 gallons per inch of diameter per mile per 24 hours for sewers up to and including 24 inches in diameter, and shall not exceed 5,000 gallons per mile per 24 hours for all sizes larger than 24 inches in diameter.

### 3.06 REPAIR OF PIPING LEAKS

- A. Procedures: Repair leaks as follows:
  1. Replace broken pipe or joint assemblies found to leak. Regardless of the amount of infiltration or leakage measured, repair and seal all visible or detectable leaks in the piping, sewers, manholes, structures, and other appurtenances.
  2. When leakage occurs in excess of the specified amount, locate and repair defective manholes, valves, pipe, cleanouts or joints.
  3. If defective portions cannot be located, remove and reconstruct as much of the original work as necessary to obtain piping that meets the leakage or infiltration requirements specified herein and retest, all at no addition to the Contract Price.

### 3.07 LEAKAGE TESTS FOR CONCRETE STRUCTURES

- A. Leakage tests of wet wells, tanks, channels, containment areas, and other water retaining structures shall be performed following the requirements of ACI 350.1R and as specified herein. The Contractor shall supply all materials and labor needed to conduct the test as directed by the Engineer.
- B. Prior to start of leakage testing, the following requirements shall be met.
  1. All elements of the structure which resist any portion of the retained liquid pressure shall be in place and at specified strength levels. All concrete shall be fully cured.
  2. Structure walls shall not be backfilled prior to leakage testing.
  3. All valves, gates, blind flanges, and other non-concrete items which control the flow or otherwise retain the liquid contents of the structure, shall be

checked for watertightness. If not watertight, means shall be taken to assure watertightness during the period of the leakage test.

4. The portions of the structure to be tested shall be cleaned of all construction debris, standing water, soil, foreign materials and any other material which interferes with the exposed concrete surfaces of the structure.
5. Defective concrete shall be repaired.
6. The Contractor shall notify the Engineer a minimum of 24 hours prior to start of filling of structure for leakage testing. Leakage testing shall not start until the structure is inspected by the Engineer.

C. Filling the Structure with Water

1. The portion of the structure to be tested shall be filled at a rate not to exceed two feet per hour.
2. The structure shall be filled to the normal operating depth of the structure as indicated on the Contract Drawings. Where no operating depth is indicated or where operating depth is controlled by flowing over a weir, the structure shall be filled to a depth 6 inches below the weir or top of wall elevation, whichever is lower.
3. Water in the structure shall be maintained at the specified test elevation for a minimum of three days prior to the start of the leakage test.

D. After water has been brought to the test elevation, the exposed elements of the structure shall be inspected for leakage. All locations which exhibit any amount of leakage flow shall be repaired prior to the start of leakage testing.

E. The leakage test duration shall be determined by the Engineer based on ACI 350.1R but shall not be less than 3 days.

F. Leakage Allowance

1. For unlined concrete structures, the maximum allowable leakage rate shall be 0.075 percent of the volume per 24-hour period.
2. For concrete structures with walls lined by a waterproof material, the maximum allowable leakage rate shall be 0.050 percent of the volume per 24 hour period.

### G. Test Locations

1. Structure cells which are less than 1000 square feet in area shall have measurements of water level taken at two locations which are located approximately 180 degrees apart.
2. Structure cells which are greater than 1000 square feet in area shall have measurements of water level taken at four locations which are located approximately 90 degrees apart.
3. Each test location shall be marked and given a reference number. A reference point shall be marked on the face of the wall above the test water surface in a manner which will prevent its movement or deterioration during the period of the test.
4. Test locations must be approved by the Engineer.

### H. Evaporation and Precipitation Measuring

1. In open structures, a clear plastic calibrated open-top container not less than 18 inches in diameter and depth shall be partially filled, floated in the tank, and held in position near each measurement location.
2. The container shall be located so as not to be shaded by tank walls and away from any items passing over it such as beams or pipes.

### I. Test Measurements

1. Leakage tests shall not be started when periods of severe weather conditions or major changes in average daily temperature are predicted.
2. The following measurements shall be recorded at each test location at the start of the test period and at 24-hour intervals thereafter:
  - a. Distance from reference point to test water surface
  - b. Depth of water in the floating container
  - c. Temperature of the test water at 18 inches below water surface
  - d. Temperature of the water in the evaporation-precipitation container at mid-depth

### J. Leakage Determination

1. The change in water surface elevation at each test location shall be averaged and adjusted as follows.

2. The total change in test water surface elevation shall be adjusted by the average change in water surface elevation in the evaporation-precipitation containers.
3. Where averaged water temperature measurements vary by more than 3 degrees from start to completion of the test period, adjustment in tank volume shall be determined by change of water density resulting from the change in the average water temperature.

K. Retesting

1. The leakage test shall be considered as failed if the specified leakage allowance is exceeded or if any leakage is observed.
2. If the test becomes unreliable due to excessive precipitation or other external factors, it shall be restarted.
3. If a leakage test fails, it may be retested immediately without repairs if approved by the Engineer. If subsequent leakage tests fail, the Contractor shall repair all probable areas of leakage and the leakage test shall be repeated. The structure shall be retested until it meets the specified leakage criteria. Repairs shall be made to the probable leakage areas before each retest.

3.08 LEAKAGE TESTS FOR NON-CONCRETE STRUCTURES

- A. Steel, poly and fiberglass-reinforced plastic tanks and similar structures shall be tested for leakage by bulkheading the openings and filling the structure with water to 6 inches below the overflow water level. The tank shall be kept full until the water temperature has stabilized, but not less than 24 hours before the start of the leakage test. The leakage test shall consist of measuring the water surface elevation from a fixed point on the tank at two locations 180 degrees apart. Measurements shall be taken at the start of the test and 24 hours later.
- B. Testing shall be performed before the installation of mechanical equipment and before applying any waterproofing coatings to the outside surfaces.
- C. The exterior surface of the structure shall be inspected for leakage, especially in areas around joints.
- D. Where environmental conditions could lead to changes in water level due to evaporation or precipitation, measurement of these factors shall be made as specified for testing concrete structures.
- E. The leakage test shall be considered failed if there is any measurable drop in the water surface (after adjusting for evaporation and precipitation) during the 24-hour test period or if there is any visible leakage.

- F. If visible leaks appear or if leakage exceeds the allowable limit, the structure shall be repaired by removing and replacing the leaking portions of the structure, waterproofing the inside, or by other approved methods. After repairs are complete, the test shall be repeated.

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 02741**  
**ASPHALTIC CONCRETE PAVEMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to provide asphaltic concrete pavement roads constructed on properly prepared subgrades and in conformance to the required lines, grades and typical cross sections, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02317 - Backfilling

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and the latest addenda thereto of the following standards to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Society for Testing and Materials (ASTM)

- a. ASTM D1557, Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb (4.5 kg) Rammer and 18-in. (457-mm) Drop
- b. ASTM D2049, Tests for Relative Density of Cohesionless Soils
- c. ASTM D3786, Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics
- d. ASTM D4354, Practice for Sampling of Geosynthetics for Testing
- e. ASTM D4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
- f. ASTM D4439, Terminology for Geotextiles
- g. ASTM D4491, Test Methods for Water Permeability of Geotextiles by Permittivity
- h. ASTM D4533, Test Method for Index Trapezoid Tearing Strength of Geotextiles

- i. ASTM D4595, Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
  - j. ASTM D4632, Test method for Grab Breaking Load and Elongation of Geotextiles
  - k. ASTM D4759, Practice for Determining the Specification Conformance of Geosynthetics
  - l. ASTM D4751, Test Method for Determining Apparent Opening Size of a Geotextile
  - m. ASTM D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
  - n. ASTM D4873, Guide for Identification, Storage and Handling of Geotextiles
- 2. Federal Highway Administration (FHWA) - Geosynthetic Design and Construction Guidelines, Publication No. FHWA HI-95-038, May 1995.
  - 3. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP).
  - 4. International Standards Organization (ISO) 9002 - Quality System Certification.
  - 5. New York State Department of Transportation (NYSDOT) Standard Specifications.
  - 6. New York City Department of Transportation (NYCDOT), Bureau of Highway Operations Standard Specifications.
  - 7. Federal Specification TT-P-115 - Paint, Traffic, Highway, White and Yellow.
  - 8. New York City Building Code, Local Law 76/1968, latest edition and amendments or supplements thereto.
  - 9. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

#### 1.04 DEFINITIONS

- A. California Bearing Ratio (CBR): The ratio of (1) the force per unit area required to penetrate a soil mass with a 19 sq. cm (3 sq. in.) circular piston (approximately 51 mm (2 in.) diameter) at the rate of 1.3mm/min (.05 in/min) to (2) that required for corresponding penetration of a standard material.

- B. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- C. Typical Roll Value: Property value calculated from average or mean obtained from test data.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  - 1. The bituminous mix design for both the binder course and the wearing course, which shall include the sources of all ingredient materials, the penetration of the asphaltic cement and the percentages by weight and the number of pounds of each of the materials making up one batch.
  - 2. The laboratory analysis of the bituminous mix and the laboratory compacted density.
  - 3. Manufacturer's literature including physical, mechanical and chemical properties of the geotextile.
  - 4. Certification of geotextile's minimum average roll values and tests used to determine those properties.
  - 5. Certificate of Compliance stating that the geotextile conforms to the Specifications and the manufacturer is aware of and agrees with its intended use.
  - 6. Geotextile manufacturer's qualifications: ISO 9002 certified.
  - 7. Manufacturing quality control test results on geotextiles.

#### 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/1968, and the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Geotextile Manufacturer Qualifications: Manufacturer shall be ISO 9002 certified. Provide proof of certification or demonstrate that the standards and experience required for certification are possessed, all to the satisfaction of the Commissioner.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Wrap geotextile in black protective wrap.
- B. The geotextile rolls shall be labeled as per ASTM D4873.
- C. Deliver, store and handle rolls in manner to prevent damage.
- D. After unloading, inspect rolls for defects and damage.
- E. Do not leave covered rolls exposed to elements for more than 30 days unless additional heavy-duty waterproof cover is provided. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding 14 days.
- F. Store rolls off ground, protected from precipitation, ultraviolet radiation, strong chemicals, sparks and flames, temperatures in excess of 160°F and other environmental conditions that could cause damage to geotextile.
- G. Prevent damage to wrappings and geotextile.

## PART 2 PRODUCTS

## 2.01 GEOTEXTILE MANUFACTURERS

- A. Amoco Fabrics & Fibers Co./Amoco 2006
- B. Nicolon Mirafi Group/600X
- C. Synthetic Industries/Geotex315ST
- D. Or approved equal.

## 2.02 MATERIALS

- A. Geotextile: Provide geotextile fabric conforming to the requirements specified in this Section:
  - 1. Woven slit film polypropylene geotextile; individual slit films woven together in manner to provide dimensional stability relative to each other.
  - 2. Resistant to ultraviolet degradation and biological and chemical environments normally found in soils.
  - 3. Minimum Average Roll Values

Property	Test Method	Units	Results
Wide Width Tensile Strength	ASTM D4595	kN/m (lbs/in)	31x30.6 (175 x 175)
Grab Tensile Strength	ASTM D4632	N (lbs)	1335 x 1335

Property	Test Method	Units	Results
Grab Elongation	ASTM D4632	Percent	15 x 15
Puncture Strength	ASTM D4833	N (lbs)	555 (125)
Mullen Burst	ASTM D3786	KPa (psi)	4475 (650)
Trapezoidal Tear	ASTM D4533	N (lbs)	530 x 530
Apparent Opening Size	ASTM D4751	mm	0.212
Permittivity	ASTM D4491	sec-1	0.06
Water Flow Rate	ASTM D4491	1/min/m <sup>2</sup> (gpm/ft <sup>2</sup> )	200 (5)
UV Resistance (percent retained at 500 hours)	ASTM D4355	Percent	90

B. Roads: Provide asphaltic concrete pavement for roadways conforming to the requirements specified in this Section and to the following standards:

1. Bottom Course: Broken stone, NYCDOT, Bureau of Highway Operations Standard Specifications, Section 403-2.02, Aggregate-Coarse, Type 1, Grade B, Sizes No. 1, No. 2 and No. 4. Provide bottom course consisting of a uniform mixture of broken stone, Size Nos. 1 and 2, and add No. 4 as a filler after the coarser mixture has been rolled and compacted.
2. Tack Coat: Asphalt emulsion, NYSDOT Standard Specifications, material designation 702-9.
3. Binder Course: Binder mixture, NYSDOT Standard Specifications, Subsections 403-2.01 through 403.2.06, Table 403-1, Type 3.
4. Wearing Course: NYSDOT Standard Specifications, Subsections 403-2.01 through 403-2.06, Table 403-1, Type 6F2.
5. Treated Permeable Base: NYSTDOT Standard Specifications, Subsection 402.01 through 402.02, Table 402.1, Type 1 F9.
6. Select Granular Subgrade: NYSDOT Standard Specifications, Subsections 203-2.02-E.
7. Subbase Layer: NYSTDOT Standard Specifications, Subsections 403-2.01 through 403.2.06, Table 403-1, Type 2.
8. Surface Course: NYSDOT Standard Specification, Subsection 411-2.01.

- C. Walks: Provide asphaltic pavement for walks conforming to the requirements specified in this section and to the following standards:

1. Bottom Course: Asphaltic concrete mixture, NYSDOT Standard Specifications, Subsections 403-2.01 through 403-2.03, Table 403-1, Type 1.

## 2.03 QUALITY CONTROL

- A. Geotextile Manufacturing Quality Control: Testing shall be performed by the manufacturer at a laboratory accredited by GAI-LAP for tests required for the geotextile, at frequency exceeding provisions of ASTM D4354, with following minimum acceptable testing frequency:

Property	Test Method	Test Frequency sq m (sq ft)
Grab Tensile Strength	ASTM D4632	1/10,000 (100,000)
Grab Elongation	ASTM D4632	1/10,000 (100,000)
Trapezoidal Tear	ASTM D4533	1/10,000 (100,000)
Mullen Burst	ASTM D3786	1/10,000 (100,000)

- B. Geotextile Conformance Testing:

1. Upon delivery to site, the Construction Manager will remove samples of geotextile and send to laboratory for testing.
2. Testing will be performed at a laboratory accredited by GAI-LAP in accordance with ASTM D4759, Practice A.

## PART 3 EXECUTION

### 3.01 ROADS

- A. Asphaltic concrete pavement roads shall consist of Typical Heavy Duty Asphalt Pavement:
1. Preparation of compacted subgrade
  2. A select granular subgrade
  3. A layer of geotextile fabric laid over granular subgrade
  4. A subbase layer ( of broken stone)
  5. A layer of treated permeable base
  6. A layer of binder course
  7. A surface course

**B. Preparation of Subgrade**

1. Remove to a depth of 24 inches, top soil, boulders, muck, soft clay, spongy material and any other objectionable material. Replace removed material with approved compacted select fill material in conformance with Section 02317 – Backfilling to promote positive drainage.
2. On sites where it appears that there may be some areas containing objectionable materials, proof roll to locate the unsuitable materials.
3. Exercise care during stripping operations to prevent excessive disturbance to subgrade. Use lightweight dozers or grade-alls for low strength, saturated, non-cohesive and low cohesive soils.
4. For extremely soft ground such as peat bog areas, do not over excavate surface materials to take advantage of root mat strength.
5. If vegetation is present, remove stumps and roots extending above subgrade before grading and compaction.
6. Scrape and fill subgrades, as necessary, and thoroughly consolidate them to the required lines and grades. Consolidate subgrades for pavements by means of a smooth steel-wheel roller having a nominal gross weight of not less than 10 tons, and exerting a minimum force of not less than 300 pounds per inch of width on the compression roll faces, or approved equivalent.
7. Compact subgrade to not less than 75 percent relative density as determined by ASTM D2049, or not less than 95 percent of the maximum dry density as determined by ASTM D1557, as applicable.
8. In places where the use of a roller is impractical, compact subgrades with hand tampers weighing not less than 40 pounds and having a face not exceeding 80 square inches in area.
9. Subgrade shall be prepared not less than 100 feet in advance of the pavement to be immediately constructed.

**C. Install Granular Subgrade**

1. General: Remove all soil, rock, and other material, and utilize or dispose of these materials as required by the plans and specifications. All graded earth surfaces outside the roadway limits shall be smoothed and trimmed in reasonably close conformity (plus or minus 150 mm) of true grade. After trimming, the area shall be left in a compact and satisfactory condition, free of large stones or other objectionable materials, as determined by the Resident Engineer.



2. Where a subgrade area is defined, the material placed shall conform to 2.02 B.6 and placed and compacted in conformance with NY State DOT Section 203-3.10 and 203-3.12.

3. Compaction: See NYSDOT 203.-3.12.

**D. Installation of Geotextile**

1. After subgrade has been prepared, place geotextile in same direction as the new roadway aggregate is being laid down.
2. Do not drag geotextile across subgrade. Place entire roll on subgrade surface and roll out smoothly. Remove wrinkles and folds by stretching and holding down with sandbags as required.
3. Join parallel rolls of geotextile as follows:

<b>California Bearing Ratio (CBR)</b>	<b>Method of Joining</b>
Over 2	300-450 mm (12-18 in) overlap
1-2	600-900 mm (24-36 in) overlap
0.5-1	900 mm (36 in) overlap or sewn
Less than 0.5	Sewn
All roll ends	900 mm (36 in) overlap or sewn

4. If the CBR of the subgrade is not known, join parallel rolls by sewing them together.
5. For subgrades with CBR less than or equal to 1, where the geotextile is to provide reinforcement, the geotextile shall be pretensioned in the following manner:
  - a. Proof-roll with heavily loaded, rubber-tired vehicle. Wheel load of truck shall be equivalent to maximum expected for site. Vehicle to make at least four passes over first lift in each area of site.
  - b. Once design aggregate has been placed, use roadway prior to paving to prestress geotextile-aggregate system.
6. If required, the geotextile may be held in place prior to subbase placement with sandbags. The use of pins to anchor the geotextile will not be permitted, except at edges of existing pavement as specified below.

7. Do not place overlaps along anticipated primary wheel path locations. Place overlaps at end of rolls in direction of aggregate placement with previous roll on top.
8. When sewn seams are required, strength of seams shall be greater than or equal to 80 percent of tensile strength of unseamed geotextile as determined by same testing methods.
9. When placing woven geotextile on curves, fold or cut geotextile and overlap in direction of turn with previous fabric on top. Staple or pin folds in geotextile approximately 0.6 m (2 ft) on center.
10. When geotextile intersects an existing pavement area, extend geotextile to edge of old system and anchor it by trenching and covering the edge of the fabric with stone, or staple or pin the fabric to the ground. For widening or intersecting existing roads where geotextiles have been used, excavate edge of roadway down to existing geotextile and sew the new geotextile to the existing geotextile, or overlap and staple or pin the new fabric to the old and into the ground.
11. Prior to covering, inspect geotextile for excessive damage, including holes, rips and tears.
  - a. If excessive defects are observed, repair affected area by placing new layer of geotextile over damaged area.
  - b. Extend new layer beyond damaged area the same distance as required for overlap of adjacent rolls.
12. End-dump base aggregate on previously placed aggregate. End dumping or tailgate dumping of the aggregate directly on the geotextile will not be permitted.
  - a. For subgrades with CBR less than or equal to 1, limit pile heights to prevent possible subgrade failure.
  - b. Maximum placement thickness for subgrades with CBR less than or equal to 1 shall not exceed design thickness of road.
13. Spread and grade first lift of aggregate to 300 mm (12 in) or to design thickness if less than 300 mm (12 in) prior to compaction. Do not allow traffic on soft roadway with less than 200 mm (8 in) of aggregate over geotextile, except 150 mm (6 in) for CBR greater than or equal to 3.
14. Compact the bottom course as specified in Paragraph 3.01.D.2. Vibratory compaction shall not be used on the initial lift over the geotextile.

15. Perform construction parallel to road alignment.
16. Fill ruts formed during construction to maintain adequate cover over geotextile. Do not blade ruts down.
17. Place remaining base aggregate in lifts not exceeding 250 mm (10 in) in loose thickness and compact to specified density.
18. Equipment may operate on roadway without aggregate for geotextile installation under permeable bases if subgrade is of sufficient strength.
  - a. For soils with CBR less than or equal to 0.5, use lightweight construction vehicles for access on first lift.
  - b. Limit construction vehicles in size and weight to limit rutting in initial lift to 75 mm (3 in).
  - c. If rut depths exceed 75 mm (3 in), decrease construction vehicle size or weight or increase lift thickness.
19. Turning will not be permitted on first lift of base aggregate. Construct turn-outs at roadway edge to facilitate construction.

E. Bottom Course (Subbase layer of broken stone )

1. Spreading

- a. Spread the mixture of No. 1 and No. 2 broken stone uniformly on the geotextile with shovels from piles along the side of the roadway or from dumping boards or by means of vehicles of approved design constructed especially for this purpose, but in no case dump the material directly on the geotextile.
- b. The loose lift thickness shall be a minimum of 1.5 times the maximum particle size. The Contractor shall control the lift thickness, provided that the thickness shall not exceed the thickness limitations specified in Paragraph 3.01C, above, for installation of aggregate over geotextile, and shall not exceed the maximum allowed according to the equipment classifications in Subparagraph B of Subsection 203-3.12, Compaction, of New York State Department of Transportation Standard Specifications, and the equipment meets all specified class criteria of that Standard.
- c. Spread broken stone in sufficient quantity to provide the required thickness after rolling. The depth of stone shall be gauged by the use of cubical concrete blocks of the required thickness, or other approved means.

- d. Remove all segregated fine or coarse stone and replace it with well-graded stone.
- e. Do not spread the broken stone over wet geotextile.
- f. Do not place broken stone adjacent to manhole heads or other structures until such structures have been set to the required lines and grades.

2. Rolling and Filling

- a. After the No. 1 and No. 2 stone mixture has been laid loose, thoroughly roll it with an approved smooth steel-wheel roller having a nominal gross weight of not less than 10 tons and exerting a minimum force of 300 pounds per inch of width on the compression roll faces.
- b. Start rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one half the width of a rear wheel. A minimum of 8 passes shall be applied over each lift with the roller operating at a speed not exceeding 6 feet per second. Rolling shall be continued until there is no movement of the stone ahead of the roller.
- c. After the bottom course is thoroughly compacted, as measured by the method described in Paragraph f, below, uniformly spread No. 4 stone over the compacted area from piles along the side of the roadway or from dumping boards. Broom the filler in and roll it dry until no more filler can be forced into the voids. Remove excess filler.
- d. Do not lay over 500 lineal feet of the bottom course without it being rolled and thoroughly filled.
- e. The maximum layer thickness prior to compaction shall be 300 mm (12 in.) as specified in Paragraph 3.01C, and the final compacted thickness shall be as shown on the Contract Drawings. In confined areas, as defined by the Construction Manager, the maximum compacted layer thickness shall be 6 inches.
- f. Do not allow the surface of the completed bottom course to deviate more than one-quarter inch in five feet from the nearest point of contact nor more than 3/8-inch in 18 feet when tested by means of an 18-foot straight-edge placed parallel to the centerline of the roadway.
- g. If any irregularities develop in the surface during or after rolling of the bottom course, remedy them by loosening the surface and removing or adding broken stone as may be required, and follow by rolling the entire area, including the surrounding surface, applying filler and continuing rolling until the course is compacted satisfactorily to a uniform surface.

**F. Tack Coat**

1. Before spreading the binder course, spray the bottom course with an asphalt emulsion tack coat in the amount of 0.25 gallon per square yard. Allow the tack coat to cure until sticky or tacky. Renew and repair or replace damaged coating.
2. Tack coat shall be applied evenly by means of a truck having appropriate spray nozzles. All nozzles shall be kept free of clogs.
3. Paint contact surfaces of all curbing, gutters, manholes and adjacent pavement edges with the tack coat material.
4. Tack coat shall not be applied on a wet pavement surface or when the temperature is below 45°F.

**G. Binder Course**

1. Preparation: Clean the bottom course of all dirt and loose material, thoroughly dry it and obtain the Construction Manager's approval before laying the binder course.
2. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 45°F, or when other weather conditions would prevent proper construction of the pavement.
3. Forms: When side forms are required, accurately set them to line and grade and securely stake and brace them in place sufficiently to withstand all construction operations. Thoroughly clean and oil forms before use.
4. Spreading
  - a. Dump the binder course into the hopper of the spreader. Spread and screed it immediately to the full width required for the pavement and to such a depth that, when rolled, the required thickness is obtained. The maximum allowable compacted thickness shall be 4 inches.
  - b. When the mixture is to be spread by hand, dump it on approved steel dump sheets outside of the area on which it is to be spread and immediately distribute it into place and spread it in a uniformly loose layer.
  - c. Remove material from areas which show an excess or lack of bituminous material or an inconsistent mix and fill with new material. Respread or otherwise rectify areas which show segregation to obtain a uniform mixture in the course.

- d. Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250°F when spread.
- e. Do not lay over 500 lineal feet of binder material without it being rolled and properly compacted.

5. Compacting

- a. Rake the mixture after spreading and immediately compress it thoroughly and uniformly by either of the following methods:
  - (1) Option A - Three-roller Compaction Train: Under this option, the binder course shall be initially rolled with an approved steel-wheel roller. The roller shall overlap the previous roller pass by one-half the width of the roller.
    - (a) Immediately following the initial rolling, the course shall be rolled with an approved pneumatic rubber-tired roller. A minimum of three passes of the rubber-tired roller shall be made. One pass is defined as one movement of the roller over any point of the pavement in either direction.
    - (b) Immediately following the intermediate rolling, the course shall be finish rolled with a steel-wheel tandem roller. This final rolling shall be both longitudinal and diagonal as directed by the Construction Manager and shall remove all shallow ruts and ridges and other irregularities from the surface. Rolling shall be continued until all roller marks are eliminated.
    - (c) Under this option, the course shall not be compacted to a thickness in excess of 4 inches. No rollers shall move at speeds in excess of 3 miles per hour unless otherwise approved.
  - (2) Option B - Vibratory Compaction: Under this option, the Contractor shall use vibratory compaction equipment appearing on the current Approved List - Bituminous Concrete Vibratory Compaction Equipment in the NYSDOT Standard Specifications. The Contractor may substitute one vibratory roller in lieu of the initial roller and the pneumatic roller in the conventional three-roller compaction train stipulated under Option A. Under this option, the course shall be finish rolled with a steel-wheel tandem roller having a minimum weight of 8 tons. This finish roller shall add a minimum of two passes closely following the vibratory roller or as directed by the Resident Engineer.

- (a) One vibratory roller and one steel-wheel tandem roller shall be provided for each nominal 12-foot width of paving. Dual vibrating drum rollers meeting the requirements of a steel-wheel tandem roller and operating in the static mode may be used as the finish roller. However, this single vibratory roller shall not be used as both the initial roller and the finish roller.
- b. To prevent adhesion of the mixture to the roller, keep the drum properly moistened with water. Drums must have working water spray nozzles to keep drums moistened.
- c. Compact material thoroughly with hot irons or damp vibratory tampers along curbs, headers, manholes and similar structures and at all places not accessible to the roller.
- d. Remedy depressions which develop before the completion of the rolling by loosening the laid mixture and adding new mixture to bring such depressions to a true surface. Should any depressions remain after the final compaction has been obtained, remove the full depth of the mixture, replace it with new mixture, and reroll it to form a true and even surface. Correct all high spots, waves, bunches and honeycombing, to the satisfaction of the Resident Engineer.
- e. Remove and replace with new material areas that are unbonded after rolling, areas containing drippings, areas that are fat or lean, and areas evidencing defective construction of any description.
- f. Do not allow the surface of the completed binder course to deviate more than 1/16 inch per foot from the nearest point of contact nor more than 1/4 inch maximum when tested longitudinally with an 18-foot straight edge placed parallel to the centerline of the roadway.
- g. After final compression, the finished course shall at no point have a density less than 95 percent, as measured by a nuclear density meter, of the laboratory compacted density.

#### H. Treated Permeable Base

- 1. Weather Limitations: Do not place HMA plant mix on any wet surface or when the surface temperature is less than specified in NYSDOT Standard Specification 402 - Table 402-2, Temperature and Seasonal Requirements, or when weather conditions will prevent proper handling or finishing of the HMA mixtures.
- 2. Preparation: When specified in the contract, clean the surface of the existing pavement, fill joints and cracks, and level the surface to a uniform grade and cross slope prior to the application of a new HMA concrete course. Clean the

surface and fill the joints and cracks. Clean any foreign material resulting from construction operations from the pavement at no additional cost to the State. Leveling of the pavement surface prior to new HMA placement will be in conformance with the requirements stated below.

- a. Apply a thin, uniform tack coat as specified in NYSDOT Standard Specification Section 407, Tack Coat, to all contact surfaces of existing HMA and Portland Cement Concrete layers including such areas as adjacent pavement edges, curbing, gutters, manholes, and other structures, immediately prior to placing the HMA mixture against them.
- b. Fill depressions and wheel path ruts prior to the paving of the truing and leveling course, as directed by the Commissioner. For wheel path ruts with a depth of 7 mm, but less than 20 mm, use Shim Course. For ruts greater than 20 mm, use a 9.5 mm mixture.
- c. If a truing and leveling course is specified on the plans or in the itemized proposal, place the course(s) of a minimum variable thickness of proper plant mix necessary to bring the surface of the existing pavement to the same transverse slope and longitudinal grade required for the finished pavement surface. Test the surface of this course in the same manner prescribed in NYSDOT Specification 402-3.10, Surface Tolerance, except that the allowable variation from the true surface after compaction must not exceed 10 mm. Unless a mixture type is specified in the plans, use NYSDOT Specification 402 Table 402-3, Mixture Selection for T&L Course, to select the appropriate mix type such that dragging of stones is minimized during placement of the mixture.

3. Spreading: Follow NYSDOT Standards Section 402-06.
4. Compacting: Follow NYSDOT Standards Section 402-07

I. Wearing Course (Surface Course)

1. Preparation
  - a. Thoroughly clean the binder course of all loose and foreign material before the top mixture is delivered.
  - b. Apply a tack coat at a rate of 0.03 to 0.07 gallon per square yard as approved by the Construction Manager.
  - c. Do not lay mixture until the Construction Manager approves the binder course and determines in all cases whether the weather conditions are suitable to permit laying.
2. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface



on which the mixture is to be placed is below 45°F, or when other weather conditions would prevent proper construction of the pavement.

3. Forms: If at the time of laying the mixture, permanent side supports such as curbs, edgings or gutters have not been constructed, firmly fasten in place suitable side forms of wood or steel, true to line and grade. In all cases, adequately support the sides of roadways until final compaction has been obtained and the mixture has hardened by cooling.
4. Spreading and Compacting
  - a. Spread and compact the wearing course until it meets the compaction and surface requirements specified above for the binder course.
  - b. Exercise the same options for achieving the required compaction as given for the compaction of the binder course.
  - c. Do not lay over 500 lineal feet of wearing course material without it being rolled and properly compacted.
  - d. Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250°F when spread.
5. Joints: Perform construction as near continuously as possible. Carefully make joints between old and new pavements, or between successive days' work, in a manner which will insure a thorough and continuous bond, as follows:
  - a. Cut back the edge of the old surface before recommencing the operation of laying, in order to present a fresh, clean surface for contact with the newly placed material.
  - b. Carefully employ hot smoothing irons to heat the old pavement sufficiently (without burning) to insure a proper bond.
6. Shoulders: If temporary forms are used, protect the edges of the finished roadway by placing and thoroughly compacting approved material to form shoulders along the roadway as shown on the Contract Drawings. Construct finished shoulders 1/4 inch above the elevation of the finished roadway edges.
7. If weather conditions necessitate delaying the installation of the wearing course for more than two days, reapply the tack coat to the binder course at the rate of 0.03 to 0.07 gallon per square yard as approved by the Resident Engineer.

### 3.02 FIELD QUALITY CONTROL

#### A. Pavement Samples:

1. When required by the Commissioner, furnish 4-inch diameter test samples cored from the binder course and from the completed pavement. The Commissioner will choose the number of cores and the locations at which the cores shall be taken. Sample cores, when required, shall be taken for every 10,000 square feet of pavement and patch.
2. Density test shall show that the sample is within 90 percent of the laboratory specimen.
3. Replace with new mixture and refinish the areas of pavement so removed without additional compensation.

### 3.03 PATCHING

- #### A.
- As directed by the Resident Engineer, remove and replace defective areas. Cut such areas and replace with fresh asphaltic concrete and compact to required density.

### 3.04 CLEANING AND PROTECTION

- #### A.
- After paving, clear surfaces of excess asphaltic concrete and all foreign matter.
- #### B.
- Protect new pavement until fully hardened.
- #### C.
- Cover openings of drainage structures until permanent covers are placed.

### 3.05 PAVEMENT MARKING

- #### A.
- Clean with power and hand brooms.
- #### B.
- Mark edges straight and uniform. Use two coats and comply with manufacturer's recommendations.

-END OF SECTION-

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**Section 02761**  
**THERMOPLASTIC REFLECTORIZED PAVEMENT MARKINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section specifies requirements for thermoplastic reflectORIZED pavement markings.

**1.02 REFERENCES**

- A. The following is a listing of the publications referenced in this Section:
1. American Association of State Highway and Transportation Officials (AASHTO)  
AASHTO T 250 Thermoplastic Traffic Line Material  
AASHTO M 247 Glass Beads Used in Traffic Paint
  2. American Society for Testing and Materials (ASTM)  
ASTM D 1155 Test Method for Roundness of Glass Spheres  
ASTM D 1213 Test Method for Crushing Resistance of Glass Spheres  
ASTM D 1214 Test Method for Sieve Analysis of Glass Spheres  
ASTM D 1535 Method for Specifying Color by the Munsell System  
ASTM E 28 Test Method for Softening Point by Ring-and-Ball Apparatus
  3. Federal Highway Administration (FHWA)  
Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
  4. National Board of Fire Underwriters

**1.03 QUALITY ASSURANCE**

- A. The quality and workmanship of the completed marking installation shall conform to 3.02 C.4 of this Section.
- B. The completed marking installation shall be warranted to the City of New York from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking, delamination, and shoving for a period of one year.

**1.04 SUBMITTALS**

- A. Submit detailed catalog cuts, manufacturer's specifications and test data of products proposed for use demonstrating conformance to the requirements of this Section.

## PART 2 PRODUCTS

## 2.01 MATERIALS

## A. White and Yellow Reflectorized Thermoplastic

1. Composition Requirements: The thermoplastic material composition shall be specifically formulated for application at temperatures greater than 400 degrees F true\* and shall show no significant break-down, or deterioration at a true temperature of 475 degrees F.

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\* True temperature as referenced in 2.01 is measured with high precision laboratory grade equipment.

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- a. The binder component shall be formulated as hydrocarbon resin or formulated as alkaloid base product as shown on the Contract Drawings. The pigment, beads, and filler shall be uniformly dispersed in the binder resin.
- b. The thermoplastic material shall be free from all skins, dirt and foreign objects and shall comply with the following requirements:

<u>Component</u>	<u>% by Weight</u>	
	<u>White</u>	<u>Yellow</u>
Binder	17.0 Min.	17.0 Min.
Titanium Dioxide	10.0 Min.	---
Glass Beads	20.0 Min.	20.0 Min.
Calcium Carbonate & Inert Fillers	49.0 Min.	**
Yellow Pigments	---	**

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\*\*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

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## 2. Physical Properties of Composition

- a. Colors: White thermoplastic composition, as placed, shall be white, free from dirt or tint. Yellow thermoplastic composition, as placed, shall be yellow, free from dirt or tint, and shall be a reasonable visual match to Munsell book notation 10YR8/14 in accordance with ASTM D 1535.
- b. Drying Time: When installed on pavement at an air temperature of 70 degrees F true, and in a thickness between 1/8 inch and 3/16 inch, the thermoplastic material shall be completely solid and shall show no damaging effect from traffic after 10 minutes.

- c. Color Retention: The thermoplastic material shall not change color during the warranty period.
- d. Yellowness Index: White thermoplastic material shall not exceed a yellowness index of 0.12 when tested in accordance with AASHTO T 250.
- e. Softening Point: The thermoplastic material shall have a softening point of not less than 194 degrees F true when tested in accordance with ASTM E 28.
- f. Specific Gravity: The specific gravity of the thermoplastic material as determined by a water displacement method at 25 degrees C shall be between 1.8 and 2.2 (referred to water at 25 degrees Celsius true).
- g. Fumes: The thermoplastic material shall not exude fumes which are toxic, obnoxious and/or injurious to persons or property when it is heated during application.

B. Reflective Glass Spheres (Pre-Mix and Drop-On)

- 1. Reflective glass spheres for use in the composition and for drop-on shall conform to the following requirements:
  - a. The glass spheres shall be colorless; clean; transparent; free from milkiness or excessive air bubbles; and essentially clean from surface scarring or scratching. They shall be spherical in shape and at least 70 percent of the glass beads shall be true spheres when tested in accordance with ASTM D 1155.
  - b. The refractive index of the spheres shall be a minimum of 1.50 as determined by the liquid immersion method at 25 Degrees C true.
  - c. The silica content of the glass spheres shall not be less than 60 percent.
  - d. The crushing resistance of the spheres shall be the average resistance when tested in accordance with ASTM D 1213 for a 40 lb. dead weight for 20 to 30 mesh spheres.
  - e. The glass spheres shall have the following grading when tested in accordance with ASTM D 1214:

<u>U.S. Standard Sieve</u>	<u>Mass % Passing</u>
No. 20	100
No. 30	79-95
No. 50	15-60
No. 80	0-15

2. Glass spheres for drop-on shall be treated with a moisture-proof coating meeting the flow requirements of AASHTO M 247 Section 4.4.2, shall not absorb moisture during storage, shall remain free from clusters, and shall flow freely from dispensing equipment.
- C. Primer: Type III primer for use on both bituminous and Portland cement concretes shall be of the type recommended by the manufacturer of the thermoplastic material and shall be designed to dry track-free in under 5 minutes.

## 2.02 DELIVERY, STORAGE, AND HANDLING

- A. The thermoplastic material shall be manufactured in block form and packaged in suitable corrugated containers to which it will not adhere during shipment or storage. Each container shall weigh approximately 50 pounds and shall consist of blocks approximately 14 inches x 28 inches x 2 1/4 inch in size. Each container shall be sealed at the point of manufacture and plainly marked with the color, basic resin type (either hydrocarbon or alkaloid), manufacturer's name, batch number and date of manufacture, and a statement stating the contents meet the requirements of this Section. Each batch manufactured shall have its own separate number. The label shall warn the user that the material shall not be heated in excess of 440 degrees F gauge.
- B. The reflective glass spheres for drop-on application shall be shipped in strong moisture resistant bags containing approximately 50 lbs. Each bag shall be marked with the name and address of the manufacturer, and the name and weight of the material, a statement stating the contents meet the requirements of this Section, date of manufacture and batch number.
- C. Type III primer shall be shipped in pails, drums or other strong substantial containers. Each container shall be plainly marked with the brand name of the product, the name and address of the manufacturer, the date of manufacture, the quantity of material, the date of expiration or shelf life, and appropriate hazard warnings. Type III primers shall be shipped to the construction site with instructions for use affixed to each container.

## 2.03 BASIS OF ACCEPTANCE

- A. Thermoplastic material shall be accepted on the basis of sampling and inspection at the place of manufacture or in warehouse lots as determined by the Commissioner. In addition, all samples shall be accompanied with the manufacturer's certified identification of the binder formulation (e.g. "formulated as a hydrocarbon resin"). Any unauthorized tampering, opening, or breaking of seals on the containers between the time of sampling and delivery to the construction site shall be cause for rejection of the material.
- B. The minimum batch size of thermoplastic material when tested shall not be less than 3000 lbs., unless the total order is less than that amount.

- C. Reflective glass spheres may be approved at the construction site on the basis of the manufacturer's certification.
- D. Type III primers will be subject to approval by the Commissioner prior to use. Requests for approval shall be accompanied with technical data including brand name, instructions for use, hazard warnings, and 1 qt. sample of the primer material.
- E. Type III primer previously approved by the Commissioner may be accepted at the construction site on the basis of the brand name labeled on the container.
- F. Any rejected materials shall be immediately replaced with materials meeting the requirements of this Section.

### PART 3 EXECUTION

#### 3.01 APPLICATION EQUIPMENT

- A. General: Thermoplastic application equipment shall be approved by the Commissioner prior to the start of application.
  - 1. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.
  - 2. Unless otherwise approved by the Commissioner, all longitudinal pavement marking lines shall be striped using only mobile applicator equipment. Longitudinal pavement marking lines include broken lines (skipline), edge lines, barrier lines, and solid lines as defined by the MUTCD.
    - a. Portable applicator equipment will be acceptable for placing all other markings; and for longitudinal marking where use of mobile applicator equipment is impractical, as approved by the Commissioner.
  - 3. Thermoplastic material shall be applied to the primed pavement surface by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for maintaining the temperature and controlling the flow of material.
  - 4. Applicators shall be equipped and constructed in such a manner as to satisfy the requirements of the National Board of Fire Underwriters.
  - 5. For heating the thermoplastic material, the applicator equipment shall include melting kettle(s) of such capacity as to allow for continuous marking operations. The melting kettle(s) may be mounted on a separate "supply" vehicle or included as part of the application equipment. The kettle(s) shall be capable of automatically heating the thermoplastic material to, and maintaining it at an indicated gauge temperature of 420 degrees F to 430 degrees F. The heating mechanism shall be by means of thermostatically



controlled indirect heat transfer medium. Direct heating of the melting kettle by flame will not be permitted.

6. Thermoplastic material temperature gauges accurate to plus or minus 15 degrees F shall be provided at both ends of each kettle and reservoir, and in each extrusion shoe, in such a manner as to be visible and capable of monitoring the thermoplastic material temperature throughout the marking operation.
7. Applicator equipment including separate "supply" kettles shall be constructed to provide continuous mixing and agitation of the thermoplastic material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe(s) shall be so constructed as to prevent accumulation and clogging. All parts of the equipment which come into contact with material shall be so constructed as to be easily accessible and exposable for cleaning and maintenance. The equipment shall be constructed so that mixing and conveying parts, up to and including the extrusion shoe(s), maintain the material at the required application temperature.
8. The applicator equipment shall be so constructed as to:
  - a. Insure continuous uniformity in the dimensions of the stripe;
  - b. Provide a means for cleanly cutting off stripe ends squarely;
  - c. Provide a method of applying "skip" lines; and
  - d. Be capable of applying various widths of traffic markings from 3 to 12 inches wide.
9. The applicator equipment shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow up to 10 lbs. per 100 sq. ft. of thermoplastic material. The bead dispenser shall be automatically operated in such a manner that it will only dispense beads while the thermoplastic material is being applied.
10. Applicator equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

#### B. Mobile Applicator Equipment

1. The mobile applicator shall be defined as a truck mounted, self-contained pavement marking machine that is capable of applying hot thermoplastic material by the extrusion method. The unit shall be equipped to maintain and apply the thermoplastic material at an indicated gauge temperature of 420 degrees F and at the widths and thicknesses specified in this Section. The

mobile unit shall be capable of operating continuously and of installing a minimum of 20,000 linear feet of longitudinal markings in 8 hours.

2. The mobile applicator shall be equipped with melting kettle(s) or materials storage reservoir(s) and a glass bead hopper of such capacity as to allow for continuous marking operations. The kettle(s) or reservoir(s) shall be capable of heating and/or holding the thermoplastic material at an indicated gauge temperature of 420 degrees F.
3. The mobile applicator shall be equipped with an extrusion shoe(s), and shall be capable of marking edge-line and center-line stripes. The extrusion shoe(s) shall be:
  - a. Closed, heat jacketed, or suitably insulated units;
  - b. Apply the molten thermoplastic at an indicated gauge temperature greater than 415 degrees F; and
  - c. Capable of extruding a uniform line pre-set at 3 to 12 inches wide at a thickness of not less than 1/8 inch or more than 3/16 inch.
4. The mobile applicator shall be equipped with an electronic and programmable line pattern control system, or mechanical control system, so as to be capable of applying skip or solid lines in any sequence, and through any extrusion shoe in any cycle length.

#### C. Portable Applicator Equipment

1. The portable applicator shall be defined as hand operated equipment, specifically designed for placing hot extruded thermoplastic installations such as crosswalks; stop bars; legends; arrows; and short lengths of lane, edge, and centerlines. The portable applicator reservoir shall be loaded with hot thermoplastic material from the supply vehicle melting kettle(s).
2. The portable applicator shall be equipped with all the necessary components, including the material storage reservoir, glass bead hopper, temperature gauges, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding and applying the molten thermoplastic at indicated gauge temperatures greater than 415 degrees F; of extruding a line of generally uniform cross-section, pre-set at 3 to 12 inches in width, and at a thickness of not less than 1/8 inch nor more than 3/16 inch.

### 3.02 INSTALLATION

#### A. General

1. Pavement markings shall be applied at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings and the MUTCD.
2. Before any pavement marking Work is begun, a schedule of operations shall be submitted to the Commissioner for approval.
3. When pavement markings are applied under traffic conditions, the Contractor shall provide all necessary qualified personnel, flags, markers, signs, etc. to maintain and protect traffic, and to protect marking operations and the new markings until thoroughly set.
4. The application of pavement markings shall be performed in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.
5. The Contractor shall be responsible for removing, to the satisfaction of the Commissioner, all tracking marks, spilled thermoplastic, and thermoplastic applied in unauthorized areas.
6. When necessary, the Contractor shall establish marking alignment points at 25 ft. intervals throughout the length of the marking area or as otherwise approved by the Commissioner.
7. Thermoplastic pavement markings shall be placed upon dry pavement surfaces. At the time of installation the pavement surface temperature shall be a minimum of 55 degrees F and the ambient temperature shall be a minimum of 49 degrees F and rising.

#### B. Surface Cleaning and Preparation of Pavement

1. The Contractor shall clean the pavement surfaces to be marked to the satisfaction of the Commissioner immediately prior to priming and marking application. Surface cleaning and preparation shall be performed only in the area of the thermoplastic markings application.
2. At the time of application of the thermoplastic material, all pavement surfaces shall be dry, free of oil, dirt, dust, grease and similar foreign materials and the primer shall be tack free.

## C. Application

1. All pavement surfaces (new and existing) to be marked shall be primed with Type III primer applied to bituminous concrete and/or Portland Cement concrete pavements at the rates and in accordance with the recommendations of the manufacturer of the thermoplastic material. The primer shall dry tack-free in less than 5 minutes.
2. The thermoplastic material shall be applied at an indicated gauge temperature no lower than 415 degrees F at the point of deposition. As used in this Section, the point of deposition shall be defined as within the extrusion shoe.
3. Immediately following application, reflective glass spheres shall be dropped onto the molten thermoplastic marking at the rate of 5 lbs per 100 sq. ft. of composition.
4. Upon cooling to ambient pavement temperature, the resultant marking shall be an adherent reflectorized strip of a thickness not less than 1/18 inch or more than 3/16 inch, and of the width and dimensions shown on the Contract Drawings, capable of resisting deformation by traffic. The exposed marking surface shall be smooth, with no pockmarkers, blisters, or other surface blemishes evidencing improper application, temperature or equipment malfunction. The pavement markings shall show a smooth alignment with continuous uniformity of the required dimensions and widths.

-END OF SECTION-

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**Section 02762**  
**TRAFFIC PAINT PAVEMENT AND PIER MARKINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section specifies requirements for the installation of new painted pavement markings and the removal of any related or conflicting pavement markings. The Contractor shall furnish and apply pavement marking paints, including glass beads thereto, at the locations and in accordance with patterns indicated on the Contract Drawings or as instructed by the Commissioner, and in conformance with these Specifications.

**1.02 REFERENCES**

- A. The following is a listing of the publications and specifications referenced in this Section:
1. Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
  2. American Society for Testing and Materials (ASTM)  
ASTM D 1155 Test Method for Roundness of Glass Spheres  
ASTM D 1213 Test Method for Crushing Resistance of Glass Spheres  
ASTM D 1214 Test Method for Sieve Analysis of Glass Spheres  
ASTM D 1535 Method for Specifying Color by the Munsell System
  3. Federal Specification - (Reference specification for testing procedures only. See Part 2 of this Section for complete specification requirements.)
  4. TT-P-85e, September 15, 1977
  5. Federal Test Method Standard 141b, dated February 1, 1979 (or more recent) Paint, Vanish, Lacquer, and related materials
  6. Current ASTM tests

**1.03 QUALITY ASSURANCE**

- A. Warranty: The pavement markings shall be warranted by the Contractor against abrasion, bleeding, blistering, chipping, cracking, fading, flaking, loss of adhesion, peeling, softening, or other deterioration for a period of 6 months from the date of installation.

**B. Tolerances**

1. Width of Lines: Minus zero, plus 1/8 inch.
2. Length of skip or lane lines and unpainted surface between the skip lines shall be plus or minus 3 inches.
3. Location of Directional Arrows, Messages, and Stripes within 2 inches of locations shown on the Contract Drawings.
4. Size of Letters and Arrows: plus or minus 2 inches.

**1.04 SUBMITTALS**

- A. Submit detailed catalog cuts, manufacturer's specifications and test data of products proposed for use demonstrating conformance to the requirements of this Section.
- B. A schedule of pavement marking to be performed.
- C. Submit proposed means of cleaning, removing, or obliterating existing or unsatisfactory markings to the Commissioner for approval prior to commencing corrective work.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Formulation and Manufacturing: The paint shall be formulated and manufactured from first-grade raw materials and shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. The materials shall show no hard settling or gelling upon storage in the sealed containers as received that will affect the performance of the product. The paint shall be furnished ready for use. No additional thinner shall be added. Total volatile organic substances (VOC's) in the paint shall not exceed 2.08 lbs/gal. (250 grams/liter). The paint shall contain less than .06% lead or chromium in final composition.
- B. Directional Reflectance - The daylight directional reflectance of the white paint (without glass spheres) shall not be less than 84% and not less than 54% for yellow (relative to magnesium oxide), when tested in accordance with ASTM E-97. Furthermore, the yellow shall substantially match the "Light Limit V +" chip on the Highway Yellow Color Tolerance Chart (PR Color #1, June 1965). Yellow shall conform to the Federal Standard 595a No. 33538.
- C. Flexibility - The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P-85e, Section 3.4.6.

- D. Bleeding - The paint shall have a minimum bleeding ratio of 0.94 when tested in accordance with Federal Specification TT-P-85e, Section 4.4.8. The asphalt saturated felt shall conform to Federal Specification HH-R-590.
- E. Weight/Gallon - The paint shall have a minimum weight per gallon of 14.5 yellow; 15.1 white.
- F. Viscosity - The consistency of the paint shall be not less than 75 or more than 100 Krebs Units at 25 C, when tested in accordance with ASTM D-562.
- G. Dry Opacity - ASTM D-2805 The film shall be applied with a .005 inch Bird Applicator. The minimum Contract Ratio of the white and yellow paint shall be 0.96.
- H. Water Resistance - The paint shall conform to Federal Specification TT-P-85e, Section 3.4.7. There shall be no blistering or appreciable loss of adhesion, softening or other deterioration after examination.
- I. Field Drying Time - The paint, when applied at 11 mils +/- 1 mil wet film thickness and 160 F at the gun and with a glass spheres at the rate of six pounds per gallon of paint, shall dry to no pickup under one minute when tested by simulated passing with a passenger car. A line showing no visual deposition of the paint to the pavement surface when viewed from a distance of fifty feet shall be considered non-tracking and conforming to the requirement of the field drying time.
- J. Lab No. Pickup - The paint when tested by Federal Specification TT-P-85e, Section 4.4.6 shall not be greater than 30 min.
- K. Fineness of Grind - The paint shall have a minimum fineness of grind of 3 Hegman.
- L. Total Non-Volatile - The paint shall have a total non-volatile content of not less than 85% by weight.
- M. Abrasion Resistance - No less than 35 Liters of sand shall be required for removal of the baked paint film. The abrasion resistance test shall be in accordance with TT-P-85e, Section 3.5.2.1 (10 Liters per mil of dried paint)
- N. Shelf Life - The paint shall have a usable shelf life of not less than 6 months. The paint shall have no hard settling, caking or separation. The paint shall be able to be mixed easily by means of mechanical stirrer. Paint is to be stored in inside structures at normal room temperature.
- O. The paint shall be lead and chromium free (less than .06%).
- P. The dried paint shall match Federal Color Standards -- White 595a and Yellow 33538.



- Q. Appropriate cleaning solvents are to be prescribed. These solvents are to be environmentally safe per NY & NJ Regulations.
- R. Material Safety Data Sheets (MSDS) are to be part of every shipment and test sample of paint and cleaning solvent.
- S. The beads for reflectorizing the paint shall be glass of a composition designed to be highly resistant to traffic wear and to the effects of weathering. The beads shall be colorless, clean, transparent, free from milkiness or excessive air bubbles, and essentially free from surface scarring or scratching. They shall be spherical in shape and at least 70% of the glass beads shall be true spheres.

1. The silica content of the glass beads shall not be less than 60%.
2. The beads shall have a refractive index between 1.50 and 1.65 when tested by the liquid immersion method at 25 degrees Celsius.
3. The spheres shall meet the following gradation:

<u>U.S. Standard Sieve</u>	<u>Min.</u>	<u>Max. Passing</u>
No. 20; Retained No. 30	5%	20% Passing
No. 30; Retained No. 50	30%	75% Passing
No. 50; Retained No. 80	9%	32% Passing
No. 80	0%	10%

4. The beads shall show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps. They shall flow freely and to the satisfaction of the Commissioner from the dispensing equipment at any time when surface and atmospheric conditions are satisfactory for painting.
  5. The glass beads shall be packed in waterproof, plastic lined burlap, or plastic lined paper bags. Each bag shall be marked with the name and address of the manufacturer and the name and net weight of the material.
- T. Testing of Glass Beads - The properties indicated above shall be determined in accordance with the following methods of test:
1. Sphericity: Irregularly shaped particles (out-of-round) shall be tested in accordance with ASTM D1155
  2. Gradation: Tested in accordance with ASTM D1214.

3. Moisture Resistance: The spheres shall pass the following moisture resistance test:
  - a. Place two pounds of spheres in a washed cotton bag, having a thread count of 50 per square inch (warp and woof) and immerse the bag in a container of water for 30 seconds. Remove the bag and force excess water from the sample by squeezing the bag. Suspend and allow to drain for two hours at room temperature (70-72 F). Then, mix the sample in the bag by shaking thoroughly. Transfer sample slowly to a clean, dry glass funnel having a stem 4" in length, with 3/8" inside diameter stem entrance opening and a minimum exit opening of 1/4". The entire sample shall flow freely through the funnel without stoppage. When first introduced into the funnel, if the spheres clog, it is permissible to lightly tap the funnel to initiate the flow.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

##### A. General

1. All final, interim, and temporary pavement markings and patterns shall be placed as shown on the Contract Drawings and in accordance with the Federal MUTCD.
2. Before any final pavement marking work is begun, a schedule of operations shall be submitted to the Commissioner for approval. A schedule for temporary markings and patterns for detours and other temporary traffic controls shall also be submitted to the Commissioner for approval prior to placement. At least 48 hours advance notice must be given to the Commissioner before performing any pavement marking work.
3. When pavement markings are applied under traffic, the Contractor shall provide all necessary flaggers, signs, and other traffic control devices to maintain and control traffic, and to protect the marking operation and the new markings until thoroughly dry. The application of pavement markings shall be done in the general direction of traffic; striping against traffic shall not be allowed. Short duration lane and work area closures shall be in accordance with the requirements of Section 01550 – Vehicular Access and Parking.
4. The Contractor shall be responsible for cleaning the pavement to the satisfaction of the Commissioner, of dust, dirt and other foreign material which may be detrimental to the adhesion of the paint film.
5. Detour and other temporary or conflicting markings shall be removed as soon as practicable as directed by and to the satisfaction of the Commissioner. If darkness or inclement weather interferes with the removal operations, such

operations shall be accomplished during the next daylight period or as soon thereafter as weather permits.

6. The method of removal is subject to the approval of the Commissioner. Painting out pavement markings is generally not permitted, and if approved will only be permitted for very short term use. Grinding, scraping, sandblasting, etc., must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist.
7. When necessary, the Contractor shall establish marking line points at 30 foot intervals throughout the length of the pavement, or as directed by the Commissioner.
8. The paint shall be applied in strict accordance with the manufacturer's recommendations for use. Further, at the time of application pavement surfaces shall be thoroughly dry.

**B. Application of Pavement Markings**

1. Except as noted herein, painted pavement markings shall be applied with atomizing spray type striping machines. The striping equipment may be either truck-mounted or hand-operated. All equipment shall be compatible with and suitable for the application of the type of paint being used.
2. Applied markings shall have clean-cut edges, true and smooth alignment and a minimum uniform wet film thickness of 15 mils. Glass beads shall be applied uniformly over and into the wet paint film at the rate of 6 lbs per gallon of paint. Glass bead dispensers shall be of a type that will mechanically and automatically give such performance.
3. Upon approval by the Commissioner, paint rollers or brushes may be used for marking cross-hatched and solid painted gore areas, letters, symbols, stop bars, short temporary detours or other such areas as directed by the Commissioner. When rollers and brushes are allowed, glass beads shall be applied to the wet paint film at the specified rate and in a manner suitable to the Commissioner.
4. The Contractor shall repaint, or remove and reapply, any pavement markings that fail to satisfy the requirements specified in this Section, at no cost to the City of New York.
5. The Contractor shall continuously monitor, maintain, and repair all installed pavement markings until completion of the Contract.

**-END OF SECTION-**

**Section 02771**  
**CONCRETE CURBS, HEADERS & SIDEWALKS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, and equipment required to provide concrete curbs, headers, and sidewalks, as shown, specified and required.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 03100 - Concrete Forms and Accessories
- D. Section 03300 - Cast-in-Place Concrete
- E. Section 03350 - Concrete Finishes
- F. Section 09911 - Exterior Painting

**1.03 REFERENCES**

- A. ASTM A36 - Carbon Structural Steel
- B. New York City Department of Transportation (NYCDOT), Bureau of Highway Operations Standard Specifications

**1.04 DESIGN REQUIREMENTS**

- A. Concrete curbs, headers, and sidewalks which are outside the building line of the site and under jurisdiction of other City agencies, even though constructed as part of this Contract, shall be constructed in accordance with the Rules and Regulations, Standard Details and Standard Specifications of the governing agency in effect at the time of the award of this Contract and as further defined in the Contract Drawings and these Specifications.
- B. Concrete for curbs, headers, and sidewalks which are inside the building line of the site and not under the jurisdiction of other City agencies shall be stone concrete, proportioned, mixed, placed, cured and protected in accordance with the requirements of Section 03300 - Cast-In-Place Concrete.
- C. All concrete used in constructing curbs, headers, and sidewalks shall be Class 25 in accordance with Section 03300 - Cast-In-Place Concrete.

**1.05 SUBMITTALS**

- A. The Contractor shall furnish all working drawings and material specifications for the approval of the Engineer in accordance with the requirements of Section 01330

- Shop Drawings. Submittals shall include, but not be limited to those required in Section 03300 - Cast-In-Place Concrete.

- B. The Contractor shall submit marked-up drawings and shop drawings including shop and field test reports of concrete samples tested in an approved laboratory.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Coarse aggregate, unless otherwise specified, shall conform to the requirements of Section 03300 - Cast-In-Place Concrete.
- B. Concrete shall be air-entrained in accordance with Section 03300 - Cast-In-Place Concrete.
- C. Material for foundation of curbs, headers, and sidewalks shall consist of clean cinders complying with the requirements of Section 2.11, Class 2; NYC Department of Transportation Standard Specifications, or Size No. 3 broken stone or gravel complying with the requirements of Section 2.02, NYC Department of Transportation Standard Specifications, 100 percent of which passes a 2-1/2-inch square sieve; or other approved broken concrete, 100 percent of which passes a 2-1/2-inch square sieve; or other approved granular material containing not more than 5 percent material passing a No. 200 mesh sieve and not more than 5 percent retained on a 2-inch square sieve.
- D. Preformed expansion joint filler shall be Type IV as described in Section 2.15 of the Standard Specifications of the New York City Department of Transportation, Bureau of Highway Operations.
- E. Joint sealing compound for horizontal joints shall be asphaltic blown joint filler as described in Section 2.16 of the Standard Specifications of the New York City Department of Transportation.
- F. Structural steel shall be ASTM A36.

### 2.02 SOURCE QUALITY CONTROL

- A. Concrete shall be tested and evaluated for strength and acceptance in accordance with the requirements of Section 03300 - Cast-In-Place Concrete.

## PART 3 EXECUTION

## 3.01 SIDEWALK INSTALLATION

- A. Concrete sidewalk shall be of the width shown or otherwise specified and shall be laid on 6 inches thick compacted broken stone base, unless otherwise specified or shown on the Contract Drawings.
- B. Sidewalk shall consist of a single course of concrete 4 inches thick, unless otherwise shown on the Contract Drawings.
- C. Excavation and subgrade preparation shall be in accordance with the requirements of Section 02316 - Excavation. All existing material within the required 6 inches of foundation shall be removed in its entirety. Additional depth of foundation material for special conditions shall be placed as required by the Engineer.
- D. Materials: Foundation material shall be placed on the prepared subgrade and thoroughly compacted into a course not less than 6 inches thick. The top surface shall be parallel to the finished grade and at a distance below the grade equal to the specified thickness of concrete.
- E. Forms: Forms shall be in accordance with Section 03100 - Concrete Forms and Accessories.
- F. Slabs: Concrete sidewalk shall be built in approximately 20-foot lengths between expansion joints. The sidewalk shall be separated from adjoining structures by expansion joints. When directed, these joints shall be filled with dry sand. Expansion joints in sidewalk shall coincide with expansion joints in curb. Tooled control joints not less than 1/2 inch in depth shall be provided where at four foot intervals unless otherwise shown on the Contract Drawings.
- G. Expansion Joints: Transverse expansion joints shall be 1/2 inch in width and shall be filled with preformed joint filler to within 1 inch of the sidewalk surface. The top one inch shall be sealed with asphaltic blown joint filler complying with the requirements of Section 2.16 of the New York City Department of Transportation Standard Specifications.
- H. The foundation material shall be wetted immediately before concrete is placed. The concrete shall be placed within the forms and thoroughly tamped until the surface is at the finished grade.
- I. The top surfaces shall be finished in accordance with Section 03350 - Concrete Finishes. Each rectangular slab shall have all edges neatly rounded with proper tools and be bounded on all sides by a troweled border about 1 inch in width. Surface texture of pedestrian ramps shall be transverse grooves, 1/2 inch wide by 1/4 inch deep on 2-inch centers.

- J. Backfilling shall follow the removal of forms as soon as practicable and, unless otherwise permitted, shall be of clean earth, satisfactorily compacted. Backfilling shall conforming to the requirements of Section 02317 - Backfilling.
- K. Concrete sidewalk shall be cured according to Section 03300 - Cast-In-Place Concrete.

### 3.02 CURB AND HEADER INSTALLATION

- A. Concrete curbs, headers, and steel faced concrete curbs, except as otherwise detailed and specified, shall be constructed in accordance with the applicable provisions of Sections 4.08 and 4.09, Standard Specifications of the New York City Department of Transportation, Bureau of Highway Operations, except that concrete strength shall conform to Class 25 as indicated in Section 03300 - Cast-In-Place Concrete. Depressed curbs shall be provided where specified or shown on the Contract Drawings.
- B. Steel street curbs shall conform to ASTM A36 of the size indicated on the Contract Drawings. The length of straight runs shall be not less than 10 feet nor more than 20 feet. Curved curb angles shall be bent to the radius indicated, and provided with a straight tangent at each end, 3 feet in length. Special steel curb angles of approved type shall be provided at drop curbs. Where the length of the special drop curb exceeds 20 feet, it shall be spliced with an approved type butt welded joint. Anchors shall be welded to all steel curbing. The steel curbs shall be placed within the forms, upon suitable chairs, to the proper lines and grades. The joints between units of curbing shall be 1/8 inch. All surfaces of steel curbing, including anchors, shall be thoroughly cleaned of all rust, oil, grease, scale or other foreign matter before concrete is placed. All surfaces of steel curbing which are to remain exposed in the finished work shall be painted in the shop in accordance with Section 09911 - Exterior Painting. Finish coats shall be gray in color.
- C. Granite and bluestone street curbs and headers shall be Class A dressed curbs and headers conforming to the requirements of Section 2.12 of the City of New York Department of Transportation, Bureau of Highway Operations Standard Specifications. When specified, a concrete cradle shall be used conforming to the provisions of Section 4.07 of the Standard Specifications of the Department of Transportation, Bureau of Highway Operations, except that concrete strength shall conform to Class 25 as indicated in Section 03300 - Cast-In-Place Concrete.

-END OF SECTION-

**Section 02780**  
**CONCRETE PAVERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish and install interlocking concrete paver units on sand setting bed, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Society for Testing and Materials (ASTM):

- a. ASTM C33, Concrete Aggregates.
- b. ASTM C140 Sampling and Testing Concrete Masonry Units and Related Units.
- c. ASTM C936, Solid Concrete Interlocking Paving Units.
- d. ASTM C1645 Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units

2. National Concrete Masonry Association (NCMA)

- a. Shapes and Sizes Directory

3. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.

4. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

5. New York State Department of Transportation (NYSDOT), Standard Specifications



**1.04 SUBMITTALS**

- A. Prepare and submit the following in accordance with the provisions of the General Conditions and Section 01330 - Shop Drawings:
  - 1. Product data for paving units and filter material. Demonstrate conformance to performance and material criteria specified.
  - 2. Shop Drawings: Indicate dimensions of concrete paving units.
  - 3. Samples of concrete paving units to indicate color and shape selections. Samples shall be approved by the Commissioner.
  - 4. Samples of filter material.
  - 5. Sieve analysis for grading and bedding of joint sand.
  - 6. Test results for compliance of paving units to requirements of ASTM C936 from an independent testing laboratory.

**1.05 QUALITY ASSURANCE**

- A. All work shall comply with the provisions of the Building Code of the City of New York, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.

**1.06 MOCK-UPS**

- A. Furnish and install a 10 ft. x 10 ft. paver area as described in Article 3.02 of this Section and in accordance with the requirements of Section 01452 – Mock-Up Requirements, for approval of the joint sizes, laying pattern, color, and texture of the installed pavers. This area shall be the standard from which the work will be judged.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or snowfall or removal by wind. The covering shall be weighted to resist removal by wind.

## 1.08 ENVIRONMENTAL CONDITIONS

- A. Do not install sand or concrete pavers during rain or snowfall or on snow-covered or ice-covered surfaces.
- B. Do not install on frozen sand.

## PART 2 PRODUCTS

## 2.01 MANUFACTURED UNITS

- A. Concrete pavers shall meet the following requirements set forth in ASTM C936, with the following enhanced properties:
  - 1. Minimum average compressive strength of 10,000 psi, with no individual unit less than 9,000 psi.
  - 2. Average absorption of samples tested not greater than 4.0% with no unit greater than 5% when tested in accordance with ASTM C140.
  - 3. Freeze-thaw testing shall be performed in accordance with ASTM C1645 using the procedure which considers that the pavers will be exposed to deicing materials in service. Units shall also meet the freeze-thaw requirements of Material Specification 704-23 of the NYSDOT Standard Specifications..

## 2.02 BEDDING AND JOINT SAND

- A. Bedding layer and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. Bedding layer shall be crushed stone meeting the coarse aggregate requirements of ASTM C33, #8 gradation. Joint sand shall be natural or manufactured from crushed rock. Grading of samples shall be done according to ASTM C33, meeting the requirements of in Table 1 below

Table 1  
GRADING REQUIREMENTS FOR BEDDING AND JOINT SAND

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8 in.	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

## 2.03 FILTER FABRIC

- A. Filter fabric for covering drain holes beneath bedding sand shall be a non-woven polypropylene geotextile with an apparent opening size not exceeding 150µm.
- B. Acceptable products are:
  - 1. Mirafi 1100N, as manufactured by TenCate Geosynthetics North America, 365 South Holland Drive, Pendergrass, Georgia 30567; Tel: 706-693-2226, [www.tencate.com](http://www.tencate.com);
  - 2. Contech C-100NW, as manufactured by Contech Engineered Solutions LLC, 9025 Centre Pointe Drive, West Chester, OH 45069, Tel: 800-338-1122, [www.conteches.com](http://www.conteches.com);
  - 3. US 250NW, as manufactured by US Fabrics, Inc., 3904 Virginia Avenue, Cincinnati, OH 45227, Tel: 800-518-2290, [www.usfabricsinc.com](http://www.usfabricsinc.com);
  - 4. Or approved equal

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that cast-in-place concrete slab is cured sufficiently in accordance with the requirements of Section 03300 – Cast-in-Place Concrete. Do not install concrete pavers until cast-in-place concrete slab is at least 28 days old.
- B. Verify that concrete substrate is dry and ready to support sand, pavers and imposed loads.
- C. Verify gradients and elevations of slab are correct.
- D. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
- E. Beginning of installation means acceptance of slab and edge restraints.

### 3.02 INSTALLATION

- A. Secure a 12"x12" patch of filter fabric over each drain hole in concrete slab by bonding the perimeter of the patch to the slab with a suitable adhesive.
- B. Spread the sand evenly over the cast-in-place concrete slab and screed to 1 in. thickness. The screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers. Prior to spreading sand, install geotechnical textile filters at all weep holes in the cast-in-place concrete slab.

- C. Ensure that pavers are free of foreign materials before installation.
- D. Maintain straight pattern lines. Integrate pavers with adjacent pavers.
- E. Joints between the pavers shall be between 1/16 in. and 1/8 in. wide.
- F. Fill gaps at the edges of the paved area with cut pavers or edge units as shown on the Contract Drawings.
- G. Cut pavers to be placed along the edge with a double bladed splitter or masonry saw.
- H. Use a low-amplitude, high-frequency plate vibrator capable of 3,000 to 5,000 lbs. centrifugal compaction force to vibrate the pavers into the sand bed.
- I. Vibrate the pavers, sweeping dry sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within three feet of the unrestrained edges of the paving units.
- J. All work to within three feet of the laying face must be left fully compacted with sand-filled joints at the completion of each day. Cover the remaining un-compacted edge of the laying face and sand with waterproof covering.
- K. Sweep off excess sand when the job is complete.
- L. The surface elevation of pavers shall be 1/8 inch to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

### 3.03 FIELD QUALITY CONTROL

- A. After removal of excess sand, check final elevations for conformance to the Contract Drawings.
- B. The final surface elevations shall not deviate more than 3/8 inch under a 10-foot long straightedge.

-END OF SECTION-

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**Section 02821**  
**METAL FENCE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section describes the specific requirements for metal fencing. Metal fencing shall be as specified herein and as shown on the Contract Drawings. The fence shall be all metal, constructed of wire fabric fastened to top, bottom and intermediate horizontal rails and to vertical line posts, corner posts and terminal posts and shall include all system components such as gates, fittings, fastenings and other accessories with polymer coating and other protective coatings as specified.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete  
B. Section 05081 - Galvanizing

**1.03 REFERENCES**

- A. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless, Standard Specification for
- B. ASTM A 90 - Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings, Standard Test Method for
- C. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, Standard Specification for
- D. ASTM A 446 - Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality, Standard Specification for
- E. ASTM A 570 - Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality, Standard Specification for
- F. ASTM A 585 - Aluminum-Coated Steel Barbed Wire, Standard Specification for
- G. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Standard Specification for
- H. ASTM A 817 - Metallic-Coated Steel Wire for Chain-Link Fence Fabric, Standard Specification for

- I. ASTM A 824 - Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence, Standard Specification for
- J. ASTM B 6 - Zinc, Standard Specification for
- K. ASTM F 567 - Installation of Chain-Link Fence, Standard Practice for
- L. ASTM F 626 - Fence Fittings, Standard Specification for
- M. ASTM F 900 - Industrial and Commercial Swing Gates, Standard Specification for
- N. ASTM F 1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework, Standard Specification for
- O. ASTM F 1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures, Standard Specification for
- P. ASTM F 1184 - Industrial and Commercial Horizontal Slide Gates, Standard Specification for
- Q. CLF 2445 - Chain Link Fence Manufacturer's Institute: Product Manual

#### 1.04 QUALITY ASSURANCE

##### A. Installer Qualifications

1. Contractor shall select a single installer regularly engaged in the installation of metal fencing with successful experience in the erection of the type of metal fencing specified. Installer shall agree to employ only tradesmen with specific skill and experience in the erection of this type of work.
2. Contractor shall submit the name and experience record of the installer to Commissioner along with the names and telephone numbers of owners, architects or engineers responsible for the project and the approximate contract cost of the metal fencing and the amount of area installed.
3. Contractor shall submit evidence of approval of the installer by the metal fence manufacturer. Installers who have not had the type of experience required to perform the kinds of work required will not be approved.

##### B. Source Quality Control

1. Provide metal fencing system as a complete system with all gates, hardware, appurtenances and other components produced by a single manufacturer,

including custom erection accessories, fittings, clamps and fastenings as may be necessary or required.

2. Provide fence fabric imprinted with manufacturer's trade name, country of origin, core wire gauge, and finished outside diameter gauge. Material delivered to the Project site lacking this information will be rejected for use in the work and shall be immediately removed even if discovered after being incorporated in the work, at no additional expense to The City of New York.
3. Provide shipping list for materials used, endorsed with the manufacturer's voucher certifying that the material used in the metal fencing system complies with these Specifications.
4. Structural shapes of satisfactory sections and equal strengths may be substituted if approved by the Commissioner.

#### C. Performance Criteria

1. Comply with the standards of the Chain Link Fence Manufacturer's Institute for product and installation requirements and the requirements of ASTM F 567. These standards shall represent a minimum level of quality when additional information is not shown or specified in the Contract Documents.
2. The fabricator shall be responsible for providing structural calculations for the metal fence system to Contractor for submittal to Commissioner as part of Shop Drawing review. Structural analysis shall verify that all system components including, but not limited to, supports, gates, fasteners, fittings and connections meet the requirements of the New York City Building Code.
3. Member sizes, thicknesses and weights shown or specified shall be considered minimum. Where structural analysis indicates the need for additional members or increased member size, thickness or weight, these shall be provided at no additional expense to The City of New York.
4. Modifications may be made only as necessary to meet field conditions to ensure proper fitting and support of the work, and only upon submittal of Working Drawings and receipt of approval by the Commissioner.

#### D. Fabrication Tolerances

1. Fabric, posts, rails, and other supports shall be straight or uniformly curved to provide the profiles shown on the Contract Drawings, to a dimensional tolerance of 1/16 inch in 10 feet - 0 inches without warp or rack in the finished installation.



**1.05 SUBMITTALS**

- A. The Contractor shall submit the following in accordance with the requirements of Section 01330 – Shop Drawings.
- B. Samples: Submit for approval the following:
  - 1. Each component, fastener, post, rail, support, chain link fabric and other items labeled as to the use and location in the work.
  - 2. Samples approximately 6 inches long, and 6 inches square of all chain link fence fabric materials including framework members, and typical accessories. Commissioner's review will be for workmanship only. Compliance with all other requirements is the responsibility of Contractor.
- C. Shop Drawings: Submit for approval the following:
  - 1. Copies of manufacturer's technical product information, specifications and certified test reports on physical properties, and installation instructions for all metal fencing system components.
  - 2. All structural calculations verifying that all system components comply with the requirements of the New York City Building Code.
  - 3. Large scale details drawn at a scale of 3 inches equal to one foot for all connections and gate details. Drawings at a scale of 1/4 inch equal to one foot of typical metal fence assembly identifying all components, metal fence heights, locations, and sizes and weights of all rails, posts, braces, supports and footings.
  - 4. A list of all hardware and accessories.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in manufacturer's original, unopened packaging with all tags, labels and other identifying information intact and legible.
- B. Store all materials under weatherproof cover, off the ground and away from other construction activities. Do not store material in a manner which would create a humidity chamber. Provide for free movement of air under protective cover and between components of the metal fence system.
- C. Handle material in a manner that is in compliance with product institute standards and that will prevent damaging coatings.

## 1.07 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements and verify layout information and dimensions for metal fencing and gates in relation to property surveys and existing conditions.
- B. Do not begin installation and erection of the metal fencing system until final grading is completed.

## PART 2 PRODUCTS

## 2.01 MATERIALS

## A. General

- 1. All parts of the metal fence system shall be galvanized steel, except that chain link fence fabric shall be aluminum-coated steel and fittings may be galvanized malleable iron, or galvanized wrought iron.
- 2. Wire gauges shall conform to American Steel and Wire Company gauge.
- 3. Concrete for footings shall be Class 25 conforming to the requirements of Section 03300 – Cast-in-Place Concrete.
- 4. Pipe sizes shall be commercial pipe sizes complying with ASTM F 1083.
- 5. Tube sizes specified are nominal outside dimensions.
- 6. Roll-formed section sizes are the nominal outside dimensions.
- 7. Heat-form all arcs and chords before protective coatings are applied to metal.
- 8. All sizes specified are given for uncoated steel. All protective coatings are in addition to specified dimensions and sizes.
- 9. All galvanizing shall be done in accordance with Section 05081.

## B. Chain Link Fence Fabric

- 1. Fabric shall be in one-piece widths for fencing 12 feet - 0 inches and less in height to comply with Chain Link Fence Manufacturers Institute, Product Manual.
- 2. Wire mesh shall be 2-inch mesh woven throughout in the form of approximately uniform square mesh with parallel sides and horizontal and vertical diagonals using 6-gauge, ASTM A 817, Type 1, cold-drawn carbon steel wire with minimum breaking strength of 2,170 pounds and coated with

0.40 ounces of aluminum by the hot-dip process per square foot of wire surface. The fabric shall be recommended by the Chain Link Fence Manufacturer's Institute for heavy industrial usage.

3. Provide fabric knuckled on edges to prevent unraveling.

C. Framework

1. General: The following table is provided for the convenience of Contractor and provides actual OD and equivalent nominal NPS size and trade size of round members. Pipe shall be commercial grade, plain end steel pipe with standard weight walls. Steel strip used in the manufacture of pipe shall be in compliance with ASTM F 1083, Schedule 40 pipe with minimum yield strength of 25,000 psi and with 1.8 ounces of hot-dipped zinc coating per square foot of surface area. Type A coating shall be applied both inside and outside according to ASTM F 1043, as determined by ASTM A 90.

Actual OD	NPS Size	Trade Size
1.315	1	1-3/8
1.660	1-1/4	1-5/8
1.900	1-1/2	2
2.375	2	2-1/2
2.875	2-1/2	3
3.500	3	3-1/2
4.000	3-1/2	4
6.625	6	6-5/8
8.625	8	8-5/8

2. For maximum metal fence system height of 8 feet - 0 inches provide posts, gate frames and rails of the following nominal pipe sizes and minimum weights per linear foot:
  - a. Line Posts: 2-1/2 NPS @ 5.79 lbs per foot
  - b. End, Corner and Pull Posts: 3 NPS @ 7.58 lbs per foot
  - c. Gate Frames: 2 NPS @ 3.65 lbs per foot
  - d. Gate Posts
    - (1) For single gates 6 ft. wide or less, or double gates 12 ft. wide or less: 4 NPS @ 10.79 lbs per foot.

- (2) For single gates more than 6 ft. wide, or double gates more than 12 ft. wide: 5 NPS @ 14.62 lbs per foot.
- e. Top Rails, Intermediate Rails, Bottom Rails and Braces: 1-1/2 NPS @ 2.72 lbs per foot.
3. Provide manufacturer's longest length rails, with extra long expansion sleeves making firm connections but permitting expansion and contraction for each joint. Provide means for attaching the top rail securely to each gate, corner, pull and terminal post.
- D. Roll-Formed Steel: Rolled steel shapes shall be produced from structural-quality steel conforming to ASTM A 570, Grade 45, or ASTM A 446, Grade D, galvanized, with a minimum yield strength of 45,000 psi. Protective coating system shall conform to ASTM F 1043, Type A, hot-dipped galvanizing with a minimum of 4.0 ounces of zinc per square foot of surface area in accordance with the requirements of ASTM A 653.
- E. Fittings and Accessories: All fittings and accessories shall comply with ASTM F 626.
  1. Post Caps: Pressed steel, cast iron or cast aluminum alloy, fitting snugly over posts to exclude moisture; cone-type caps for terminal posts and loop-type caps for line posts.
  2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
  3. Rail Sleeves: Tubular steel, 0.051-inches thick by 7-inches long, expansion type.
  4. Tension Bars: Steel strip, 5/8-inch wide by 3/16-inches thick.
  5. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 0.40 ounces per square foot of wire surface in compliance with ASTM A 824.
  6. Tension Bands: Pressed steel, 12 gauge thick by 3/4-inch wide.
  7. Truss Rods: Steel rod, 3/8-inch diameter merchant quality with turnbuckle.
  8. Barbed Wire Arms: Pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire - arms set outward on a 45 degree angle, or vertical, and capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

## 9. Fence Latches

- a. Manufacturer's double latching bar latch devices with heavy mil polyvinyl chloride coating.
  - b. Padlock eye as integral part of latch.
10. Keeper: Provide a gate keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.
  11. Gate Hinges: 180 degree offset heavy-industrial hinges; 1-1/2 pair per leaf.
  12. Tie Wire: Aluminum; 9 gauge, alloy 1100-H4; polyvinyl chloride coated to match fence fabric.
  13. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. A locking device and padlock eyes shall be included as integral parts of the latch, permitting both gate leaves to be locked with a single padlock.

## F. Gates

1. Swing gates shall comply with ASTM F 900.
2. Sliding gates shall comply with ASTM F 1184.

- G. Hog Rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.
- H. Barbed Wire: Commercial quality steel, two strand twisted, 12-1/2 gauge line wire with 14 gauge four point barbs at 5-inch spacing - coating shall consist of 0.40 ounces of aluminum per square foot of wire surface in compliance with ASTM A 585.
- I. Galvanizing: Zinc for galvanizing shall be of High Grade or Special High Grade conforming to ASTM B 6 with a maximum aluminum content of 0.01 percent. Material shall be galvanized by the "hot-dip" process in conformity with the following standards:

Class of Work	ASTM
Structural Iron and Steel Shapes	A 123
Fittings and Accessories	F 626
Pipe	A 53

## 2.02 FABRICATION

- A. Fabrication shall be in compliance with ASTM F 1083 for metal fencing, ASTM F 1184 for horizontal slide gates, and ASTM F 900 for swing gates.
- B. In addition to specified standards, fabrication shall be in compliance with Chain Link Fence Manufacturer's Institute Standard, CLF 2445 - Product Manual.
- C. Gates
  - 1. Gate hinges shall be of the double clamping offset type. To hold the gate in the open or closed positions, each gate frame shall be provided with a keeper which automatically engages a gate shoe set in concrete. Gates shall have a drop latch with provision for a padlock. Each gate shall be provided with a heavy-duty bronze padlock and shackle chain, No. 160DHM with 11/32-inch marine brass shackle by the Master Lock Company or equal, and three keys for each padlock. Where more than one gate is required for the same enclosure, padlocks shall be keyed the same.
  - 2. All gate frames shall have intermediate horizontal rails. Gate frames shall be of welded construction and shall be galvanized after fabrication. Single gates 6 feet wide or wider and double gates 12 feet wide or wider shall be provided with diagonal bracing in one direction, extending from top to bottom rail. The diagonal bracing shall be at least 1/2 inch in diameter and shall be provided with turnbuckles.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General
  - 1. Install metal fencing system in compliance with ASTM F 567.
  - 2. Apply fabric to outside of framework. Install fencing on boundary lines inside of property line established by survey.
  - 3. Do not begin metal fence installation and erection before the final grading has been completed, and finish elevations have been established.
- B. Excavation
  - 1. Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings shown or specified, in firm, undisturbed or compacted soil.
  - 2. Unless otherwise indicated, excavate hole depths approximately 6 inches lower than post bottom.

3. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the Project site, as directed.
4. When solid rock is encountered near the surface, drill into rock at least 12 inches for line posts and at least 18 inches for end, pull, corner and gate posts. Drill hole at least 1 inch greater in diameter than the largest dimension of the post to be placed. Remove rock cores from the Site.
5. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed the minimum depths specified above.

C. Setting Posts

1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
2. Center and align posts in a continuous pour, and vibrate or tamp concrete for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
3. Posts shall be set in concrete footings, except as otherwise shown or specified. Line posts shall extend at least three feet below finished grade, and gate posts shall extend at least four feet below finished grade. Concrete footings shall have a minimum diameter of 15 inches and shall extend at least 6 inches below the bottom of the posts. Tops of concrete footings shall receive a troweled finish. Top of footing shall be 2 inches above finish grade and sloped to direct water away from posts. The portion of posts embedded in concrete shall receive two coats of an approved coal tar paint before embedment.
4. Line posts shall be spaced not more than 10 feet on centers. Install caps on tops of all posts to exclude moisture and to receive the top rail unless equal protection is afforded by combination post top cap and barbed wire supporting arm, where barbed wire is required.
5. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing materials, or other acceptable curing method.
6. Grout posts when installed in sleeved holes, concrete constructions, and rock.
7. Allow concrete to attain at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than seven days after placement, before rails, tension wire, or fabric is installed. Do not stretch and tension fabric or wires, and do not hang gates until the concrete has attained its full design strength.

**D. Chain Link Fence Fabric**

1. Pull fabric taut so that fabric remains in tension after force is released, with bottom edge 1 inch above grade. Fasten to terminal posts and gate posts with tension bars threaded through mesh and secured with tension bands at maximum intervals of 14 inches. Tie to line posts, gate frames and top and bottom rails with tie wires spaced at maximum 12 inches on posts and 24 inches on rails.
2. The tension bars shall be connected to posts and frames by means of adjustable bolts and bands spaced not more than 14 inches apart.

**E. Top Rails, Intermediate Center Rails and Bracing**

1. Install top rails through line post caps, bending to radius for curved runs, connecting sections with sleeves to form a continuous rail between terminal posts.
2. Install center rails only where shown or specified. Install center and bottom rails in one piece between posts and flush with the post on the fabric side, using rail ends and special offset fittings where necessary.
3. Install brace assemblies at end posts and at both sides of corner and pull post panels. Panels adjacent to gates shall have intermediate horizontal rails and diagonal bracing. The diagonal bracing shall run from the center of the first line post to the bottom of the terminal post.

**F. Tie Wire:** Use U-shaped wires conforming to diameter of pipe. Wire shall clasp pipe and fabric firmly, and each end of the wire shall be wrapped around the fabric at least two full turns and bent to minimize hazard to persons or clothing.

**G. Barbed Wire**

1. When barbed wire is shown or specified along the top of the fence, it shall be supported at the posts by arms inclined outward at an angle of 45 degrees.
2. The vertical members of gates shall be extended to receive the barbed wire which shall be fastened securely to prevent movement or displacement.

**H. Fasteners:** Install nuts for fittings, bands and hardware bolts on side of metal fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

**3.02 ADJUSTMENT**

**A. Gates:** After repeated operation of completed installation equivalent to three days' use by normal traffic, readjust gates for optimum operation and safety.



- B. Lubricate operating equipment and clean exposed surfaces.
- C. Repair and replace all broken or bent components. Repair coatings damaged in the shop or during field erection by recoating with manufacturer's recommended repair compound, applied in accordance with manufacturer's directions.
- D. Protect metal fencing system from construction traffic and all other damage until acceptance of the work.

-END OF SECTION-

**Section 02822**  
**ORNAMENTAL FENCE AND GATES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Open-grille fence panels and swing gates, as indicated.
- B. Screen-wall obscure fence panels as indicated.
- C. Steel picket fence panels and swing gates as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02827 - Swing Gate Operators
- B. Section 16751 - Access Control
- C. Division 17 - SCADA System requirements

**1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical data for ornamental fences, gates, rails and operating hardware. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for ornamental fences rails and gates:
  - 1. Fence and gate posts, rails, and fittings
  - 2. Ornamental fence panels/infill, reinforcements, and attachments
  - 3. Gates and hardware
  - 4. Gate operators including operating instructions
- B. Samples: For each ornamental fence, gate and rail panel type selected, submit one representative sample approximately 8 inches by 10 inches, showing panel design, fabrication workmanship and selected coating color.
  - 1. Where materials/assemblies are indicated to receive a colored finish, provide the manufacturer's color charts or 6-inch lengths of actual units showing the full range of colors available for components with factory-applied color finishes.
- C. Shop Drawings: Shop drawings showing layout, dimensions, spacing of components, interface with electric gate operator, SCADA system, and anchorage and installation details. Show locations of each different ornamental fence, rail and gate; including posts, rails, details of posts, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

1. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
  2. Wiring Diagrams: Refer to Section 02827 - Swing Gate Operators for power and control wiring and communication features.
  3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Coordination Drawings: Drawings of each gate drawn to scale and coordinating hardware. Show elevations of each gate type, showing dimensions, locations of hardware, and preparations for power, signal, and electrified control systems.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed ornamental fences, rails and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
1. Engineering Responsibility: Preparation of data for ornamental fences, rails and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. UL Standard: Provide gate operators that comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.
- F. Mockups: Build mockups of each different ornamental fence, rail and gate assembly to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. Include 10-ft length of each assembly, complete with specified finishes and complying with requirements.
1. Approval of mockups is also for other material and construction qualities specifically approved by Commissioner in writing.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Commissioner in writing.
- G. Source Limitations: Obtain each type of fence and gate through one source from a single manufacturer.
- H. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Coordination."
- I. Comply with NYC Building Code for ornamental fencing, railing and gates for structural performance criteria for lateral loading and wind loading.
- J. Welding: Qualify procedures and personnel according to the following:
  1. AWS D1.6, "Structural Welding Code--Steel."

#### 1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of ornamental fences, rails and gates assemblies that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures
    - b. Faulty operation of gate operators and controls
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering
  2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Metal Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal assemblies that show evidence of deterioration of high-performance finishes within specified warranty period.
  1. Powder Coat and Polyurethane Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

#### 1.06 PROJECT CONDITIONS

A. Field Measurements: Verify fence layout and gate openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish gate, fence and curb dimensions and proceed with fabricating gates and fences without field measurements. Coordinate curb construction to ensure that actual dimensions correspond to established dimensions.

#### 1.07 COORDINATION

A. Coordinate installation of anchorages for fence/rail posts and gates. Furnish setting drawings, templates, and directions for installing anchorages, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Atlantis Products, Inc.
- B. Ametco Manufacturing Corporation
- C. Ameristar Fence Products
- D. Or approved equal.

#### 2.02 MATERIALS

- A. Steel Bar Stock: ASTM A36
- B. Steel Tubing: ASTM A500, Grade B
- C. Aluminum Bars: 6063-T5
- D. Aluminum tubing: 6061-T6

## 2.03 FASTENERS AND ACCESSORIES

- A. General: Provide fasteners and accessories fabricated from stainless steel, type 316 alloy, unless otherwise indicated.
- B. Fasteners for Anchoring Assemblies to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated. When the size, length, or load carrying capacity of an anchor bolt, concrete anchor, or concrete insert is not shown on the Drawings, provide the size, length, type and capacity required to carry four times (safety factor) the design load.
- C. Fasteners for Interconnecting Components
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
  - 1. Material: Copper
- I. Grounding Bonding Jumpers: Braided copper tape, 1 inch wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- J. Grounding Connectors and Grounding Rods: Listed in UL 467.
  - 1. Connectors for Below-Grade Use: Exothermic welded type

2. Grounding Rods: Copper-clad steel

- a. Size: 5/8 by 96 inches

2.04 FABRICATION, GENERAL

- A. General: Fabricate ornamental fences, rails and gates to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

1. Comply with the materials, designs, configurations and other aesthetic requirements indicated on the approved Shop Drawings.

- B. Assemble ornamental fence, rail and gate assemblies in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- D. Form work true to line and level with accurate angles and surfaces.

- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.

- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

5. Form changes in directions as indicated on the Drawings.
- I. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- J. Close exposed ends of railing members with prefabricated end fittings; weld and grind smooth.
- K. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect members to other work, unless otherwise indicated.
- L. Provide inserts and other anchorage devices for connecting assemblies to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- M. Provide open grille fencing is indicated, fabricate panels from specified woven-wire mesh welded into metal channel frames. Make open mesh and frames from same metal as fence framing, unless otherwise indicated.
  1. Orient open mesh with wires horizontal and vertical, unless otherwise indicated on the approved Shop Drawing.
- N. Unless otherwise acceptable to the Commissioner, all ornamental fences, rails and gate assemblies specified herein shall be shop fabricated, cleaned and hot-dip galvanized after fabrication.

## 2.05 OPEN GRILLE FENCE SYSTEM

- A. Type: Provide ornamental steel fencing system as indicated on the drawings, consisting of modular open grille fencing panels fabricated by welding flat steel bars and rods, supported by steel posts and gates and gate hardware.
- B. Fence Panels: Fabricated from galvanized steel rods, flat bars, welded to form an open grille pattern; Lattice as manufactured by Ametco Manufacturing Corporation or approved equal.
  1. Vertical main bars: 1 by 1/8 inch flat bars spaced at 2-7/16 inches.
  2. Horizontal cross rods: 3/16 inch diameter rods spaced at 2-19/32 inches
  3. Top and bottom perimeter bars: 1 by 1/8 inch flat bars.
  4. Panel height: As indicated on drawings varies from 36 inches to 96 inches, some with tapered bottom.



5. Panel width: As indicated on drawings, 72 inches typical. Other as per manufacturer's recommendation

## 2.06 STEEL PICKET FENCE SYSTEM

- A. Type: Ornamental steel picket fencing system as indicated on the drawings, consisting of welded, galvanized steel frame and pickets formed into framed panels.
- B. Fence Panels: Fabricated from welded steel bar and tube stock, galvanized after fabrication.
  1. Horizontal Bars: 1 3/4" x 1/2" steel bar stock.
  2. Pickets: 1/2" x 1/2" steel bar stock.
  3. Posts: 2" x 2" steel tube or bar stock.
  4. Panel Height: Varies to max 144 inches. Provide ornamental configurations where indicated.
  5. Panel Width: As indicated or as per manufacture recommendations.

## 2.07 GATES

- A. Provide gates of type and size indicated on Drawings. Equip gates with manufacturer's standard hardware as required for complete functional operation unless otherwise specified in door schedule spec section 08110.
- B. Type: Provide framed hinged swinging single and double aluminum gates with a panel infill to match the "Lattice" panel as manufactured by Ametco manufacturing Corporation. or approved equal.
  1. Construction: Welded frame fabricated from aluminum bar or tubing as indicated on the drawings, with dimensions as recommended by manufacturer with aluminum open grille and aluminum picket infill panels as indicated on the drawings to match adjacent fencing.
  2. Nominal Size: As indicated on drawings.
  3. Hardware
    - a. Hinges: Stainless steel of size and type as determined by manufacturer. Provide 2 hinges for each leaf up to 4 feet high and 1 additional hinge for each additional 24 inches in height or fraction thereof.
    - b. Latch: 3/4-inch diameter slide bolt to accommodate padlock.

- c. For double gates provide pad-lockable, 5/8-inch diameter center cane bolt assembly and strike.
- 4. Fasteners: Stainless steel bolts of type, size, and spacing as recommended by fence manufacturer for specific condition
- 5. End caps: Provide aluminum caps for exposed open extruded aluminum sections and for attachment of components to posts..

## 2.08 ACCESSORIES

- A. For exposed locations, provide anti-intruder bolts consisting of cup head bolt and nut with clamping hexagon such that tightening shears hexagon and render bolt impossible to release.

## 2.09 FACTORY FINISH

- A. General: Ornamental fences, and gates shall be shop finished. All assemblies shall be factory finished with either a factory applied polyester powder coat system or a high performance epoxy/polyurethane coating system (over a hot-dip galvanized treatment), as specified herein.
- B. Steel assemblies including posts and framing shall be hot-dip galvanized to 1.25 ounces per square foot minimum zinc coating in accordance with ASTM A123.
  - 1. Unless otherwise indicated standard size components shall receive polyester powder coating; and large gate panels shall be coated with the specified high-performance epoxy/polyurethane coating system.
- C. Polyester Powder Coating: Manufacturer's standard electro-statically applied, colored polyester powder coat system acceptable to the Commissioner. Heating heat cured to chemically bond finish to metal substrate.
  - 1. Minimum hardness measured in accordance with ASTM D3363: 2H.
  - 2. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.
  - 3. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than 3/16 inch undercutting.
  - 4. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

5. Color: As selected by the Commissioner.
- D. High Performance Epoxy/Polyurethane System: Where exterior hot-dip galvanized steel assemblies are indicated to receive a high performance paint finish; provide the manufacturer's standard, fast-curing, self-priming, lead-free, two-component, epoxy primer paint selected for resistance to exterior conditions/atmospheric corrosion, for compatibility with galvanized steel substrate and shop-applied polyurethane finish paints; and for capability to provide a sound foundation for topcoats despite prolonged exposure.
1. Paint surfaces indicated in accordance with manufacturer's written instructions and capable of receiving intermediate and topcoats specified.
  2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.
  3. Selected Materials: Provide the following:
    - a. Primer: Provide "Series 66 - High Build Epoxoline" as manufactured by Tnemec, "Diamtie Primer" as by MetalCrete, "Item # PC-149" as by Bowers Industrial, "Ultralane 5780" as by Specialty Polymers and Services, Inc. or approved equal. Apply so coating application will measure 4.0 to 5.0 mils (dft) in thickness. Color tinted different from finish coat.
    - b. Finish: Provide "Series 73 - Endura-Shield" as manufactured by Tnemec, Walter Wurdack Inc, "Item # CT-370" as by Bowers Industrial or approved equal. Apply so coating application will measure 3.0 to 5.0 mils (dft) in thickness. Color as selected by the Commissioner.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of gates and fence.
1. Coordinate vehicle entrance gate installation with provision of gate operator specified in Section 02827 – Swing Gate Operators to ensure proper power supply and that conduit and wiring are concealed.
  2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install ornamental fences and gates in accordance with manufacturer's recommendations and as specified herein.
- B. Post Setting: Set posts with mechanical anchors at indicated on the approved Shop Drawings.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting mechanical devices.

### 3.03 FENCING

- A. Install fencing in accordance with manufacturer's installation instructions and approved shop drawings.
  - 1. Install fence posts plumb and level.
  - 2. Do not install bent, bowed, or otherwise damaged panels. Remove damaged components from site and replace.
  - 3. Secure fence panels with stainless steel anti-intruder bolts to fence posts. After posts have been anchored to base curb.
- B. Gates
  - 1. Install gates and adjust hardware for smooth operation
  - 2. Provide concrete center foundation depth and drop rod retainers at center of double swinging gate openings.
  - 3. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary
  - 4. After installation, test gate and operator. Open and close a minimum five times.
  - 5. Correct deficiencies and adjust.

### 3.04 GROUNDING AND BONDING

- A. Grounding: Install at maximum intervals of 1500 feet except as follows:
  - 1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.

- a. Gates and Other Fence Openings: Ground fence on each side of opening.
    - (1) Bond metal gates to gate posts.
    - (2) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
  - b. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.
  - c. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - d. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
2. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

### 3.05 ADJUSTING AND REPAIR

- A. Adjust fence and gate assemblies to maintain proper alignment; adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that hardware functions properly and accurately without forcing or binding.
- B. Touch-up damaged finished with paints and coatings identical to those shop applied systems; touch-up and repairs are subject to the sole acceptance of the Commissioner.

-END OF SECTION-

**Section 02827**  
**SWING GATE OPERATORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Provide hydraulic-powered gate operator for swing gates, hydraulic pump and control enclosure, all interconnecting wiring and hydraulic tubing, and appurtenances, including all attachments and mounting brackets.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02822 – Ornamental Fences and Gates
- B. Section 02891 - Aluminum Sign Panels and Aluminum Sign Posts
- C. Section 16751 - Access Control System
- D. Division 17 – SCADA System

**1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300 - Shop Drawings.
- B. Shop Drawings: Submit the following:

- 1. Product information for all equipment
  - a. Catalog data
  - b. Specification data
  - c. Performance and operation data
  - d. Service and calibration data
  - e. Schematic control diagram
  - f. Complete description of the control system
- 2. Arrangement and erection drawings for the equipment and controls, including:
  - a. Connections to adjacent construction
  - b. Range of travel
  - c. All electrical and mechanical connections
  - d. All underground runs of electrical and hydraulic lines
  - e. Show the size and location of the concrete mounting pad

**3. Installation instructions**

**C. Test Reports**

- 1. Submit affidavits from the manufacturer demonstrating that the gate mechanism has been tested to 200,000 cycles without breakdown.

2. Each operator shall bear a label indication that the operator mechanism has been tested for full power and pressure of all hydraulics, full stress tests of all mechanical components and electrical tests of all overload devices.
- D. Provide Operation and Maintenance manuals in accordance with Section 01831 – Operation and Maintenance Manuals.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer: A company specializing in the manufacture of security gate operators of the type specified, with a minimum of three (3) years experience and minimum of three (3) years experience with gate operators of this type and design.
- B. Installer: A firm acceptable to the Gate Operator manufacturer with a minimum of three (3) years experience installing similar equipment.
- C. Reference Standards
  1. The swing gate operator system shall be designed, built, and installed to UL325 standards and shall be listed by a NRTL testing laboratory.
  2. Complete all electrical work according to local codes and National Electrical Code.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products as described in Section 01651 - Transportation and Handling of Material and Equipment, and Section 01661 - Protection of Material and Equipment.
- B. Store products upright in the original shipping containers; products shall be covered, ventilated and protected from all weather conditions.

#### 1.06 WARRANTY

- A. Provide a five-year warranty against all defects in materials or workmanship. Defective materials shall be replaced with new materials furnished by the manufacturer at no cost to the City of New York.

#### 1.07 SPARE PARTS

- A. Provide spare parts in accordance with Section 01750 – Spare Parts and Maintenance Materials.
- B. Furnish and deliver spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification Section.

- C. The following shall constitute the minimum spare parts: all standard recommended spare parts, as indicated in the equipment manufacturer's instructions manual for each component of the system.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Hy-Security Gate Operators Model HRG 220 ST with Smart Touch Controller.
- B. Tymetal Corp
- C. Or approved equal.

### 2.02 SWING GATE OPERATOR

- A. The swing gate operator shall be of the post type, where the operator mechanism is completely contained within a steel post assembly.
- B. Operation shall be by means of a hydraulic cylinder acting upward in the post assembly to cause the post and the gate panel to rotate from zero to 90 degrees without the use of articulating arms, screw drives or mechanical devices.
- C. Rated for continuous duty.
- D. Swing arc: 90 degrees
- E. Gate shall rise 12 inches in a full 90-degree opening cycle, including a 4-inch rise at the start of the opening cycle. Gate rise shall first lift a locking pin from an embedded socket in the roadway. Gate closure shall be the reverse of gate opening; the end of the closure cycle will drop a locking pin into the embedded socket.
- F. Suitable for gate panels up to 16 feet wide.
- G. The opening and closing cycle times will vary depending on gate size and weight, from 14 to 30 seconds.
- H. The post assembly shall be fully enclosed and not offer any openings for foreign material to enter.
- I. Actuator assembly shall be supported on non-lubricated synthetic bearing surfaces. Bearings providing rotation and lift to the actuator assembly shall be permanently lubricated, 2-1/4", industrial quality sealed cam followers.
- J. Provide indexing arm to allow precise closing adjustment.



- K. Finish: Industrial galvanized metallic flame spray.
- L. Provide limit switches to limit travel in each direction.

2.03 CONTROL ENCLOSURE

- A. Provide a control enclosure to house the hydraulic pump, valves, control devices, and other required components for each gate.
- B. Enclosure: NEMA 4X stainless steel.
- C. Provide hydraulic hand pump for emergency operation.
- D. Pump motor: 460-volt, three-phase, 1 HP, 56C, TEFC, continuous duty with a minimum service factor of 1.15.
- E. All components shall have overload protection.
- F. Controls: Microprocessor based, with at least 128K of memory. Control functions available shall include, but not be limited to, the following:
  - 1. Inherent entrapment detection
  - 2. Built-in "warn before operate" system
  - 3. Built-in timer to close
  - 4. Liquid crystal display for reporting of functions
  - 5. 19 programmable output relay options
  - 6. Anti-tailgate mode
  - 7. Built-in power surge/lightening strike protection
  - 8. Capable, with optional software, of event logging EEPROM for troubleshooting diagnostics
  - 9. RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems
- G. Seven-Day Timer
  - 1. Provide a seven-day programmable timer. Timer shall keep the gates open during normal operating hours.
  - 2. Mount timer in control enclosure.

3. Power timer from the control enclosure.
4. Provide battery backup.
5. Capable of programming each day individually, or a block of days.
6. Relay Rating: SPDT, 15A at 120 VAC
7. Temperature Range: -40 degrees F to 170 degrees F
8. Provide MOV surge protection
9. Manufacturers
  - a. EMX Industries, Inc. Model DTM-9
  - b. Or approved equal.

H. Control unit transformer: 75 VA, non-jumpered taps, for all common voltages.

I. Control unit power: 24VDC.

J. Provide heater with thermostat control for wintertime operation.

#### 2.04 HYDRAULIC HOSES AND FLUID

- A. Hoses shall be 1/4", rated to 2750 working psi.
- B. Hose fittings at valve block and at actuator post assembly shall be quick disconnect type.
- C. Hydraulic Fluid: High performance, with a viscosity index greater than 375.

#### 2.05 PHOTOCELLS

- A. Provide photocells as shown and required to meet UL325 requirements for Type B1 Protection category for Class III gates.
- B. Photocells shall comply with UL325.
- C. Maximum transmit distance: No less than 65 feet
- D. Power: 24 VDC
- E. Relay Contacts: 30V, 1 A
- F. Enclosure: NEMA 4X with protective hood.

G. Mounting

1. Provide mounting post for each photocell as required.
2. Provide mounting bracket and hardware for recess mounting in barrier where shown.

H. Operating Temperature: -40 degrees F to 170 degrees F

I. Manufacturer

1. EMX Industries, Inc., Model IRB-325
2. Or approved equal.

2.06 ACCESSORIES

A. Fire Department Key Switch Assembly

1. Provide a Fire Department key switch assembly at each entrance gate. The key switch assembly shall enable the Fire Dept. to open the entrance gate without any operator assistance from the facility, and bypassing any access control restrictions required by the access control system.
2. The Fire Department key switch assembly shall consist of a lock and cylinder, a corresponding electric switch, and a weatherproof enclosure.
3. The lock and cylinder shall be keyed to the NYC fireman's key, currently a 1620 cylinder.
4. The switch shall be close-coupled to the lock, so that turning the key activates the switch. The switch shall be suitable for, and shall interface with, the entrance gate controls as specified in this section.
5. Weatherproof enclosure
  - a. Steel construction, 14 gauge minimum
  - b. Bright red powder coat finish
  - c. Prominently mark "FIRE DEPT." in white letters
  - d. Mount as shown.

B. Field Installed Placards

1. Each gate operator shall be supplied with two placards, suitable for outdoor installation, meeting the requirements of UL 325 for vehicular gate operator systems.

2. Placards shall be aluminum, and meet the requirements of Specification Section 02891.
3. Placards shall be permanently installed in accordance with UL 325.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install gate operator in accordance with the manufacturer's instructions, current at the time of installation. Coordinate locations of operators with contract drawings; other trades and shop drawings.
- B. Interface with Other Work
  1. The gate operator shall fit in the space indicated. Coordinate to precisely locate and size the gate operator support.
  2. The gate operator system shall coordinate with the ornamental fencing specified in Section 02822 – Ornamental Fences and Gates.
  3. The gate operator system shall interface with the access control system specified in Section 16751 of the Electrical Specifications.
- C. Sequence of Operation
  1. Entrance Gate: The gate shall open when triggered by any of the following systems:
    - a. Open signal from the SCADA system
    - b. Open signal from the access controls system
    - c. Open signal from the Fire Dept. key switch
    - d. Open signal from the seven-day timer
  2. Entrance Gate: The gate shall be closed by any of the following systems:
    - a. Time out after the shadow area clears. See vehicle detection below.
    - b. Reset of the system from the Fire Dept. key switch operation
    - c. Removal of the open signal from the seven-day timer
  3. Exit Gate: The gate shall open when triggered by any of the following systems:
    - a. Open signal from the locally-mounted push button station
    - b. Open signal from the seven-day timer

4. Exit Gate: The gate shall be closed by any of the following systems:
  - a. Time out after the shadow area clears. See vehicle detection below.
  - b. Removal of the open signal from the seven-day timer
5. Vehicle Detection: Vehicle detection shall be by a magnetometer-based detection system as shown. System shall include sensor, wireless access point, and contact closure card as shown. Gate controller shall use the contact closure card output to determine absence of vehicle from shadow area. Detection system shall include all power supplies, interposing relays, enclosures and appurtenances to comprise a complete operating system.

### 3.02 FIELD QUALITY CONTROL

#### A. Field Testing

1. Provide field testing in accordance with Section 01811 – Preliminary and Final Field Tests.
2. System Checkout and Startup: The Contractor, under the supervision of the Supplier, and other suppliers as applicable, shall perform the following:
  - a. Check and approve the installation of all components and all hydraulic and electrical connections between the various system components prior to placing the equipment into operation.
  - b. Conduct a complete system checkout and adjustment, including calibration, tuning, checking, and testing. When there are future operational functions included in this work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up.
  - c. The Contractor shall provide all test equipment necessary to perform the testing during system checkout and start-up.
  - d. The Contractor shall furnish the Engineer an installation inspection report certifying that all equipment has been installed correctly and is operating properly. Authorized representatives of both Contractor and the Supplier shall sign the report.

- B. Manufacturer's Field Services: The Contractor shall retain the services of the Supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

**3.03 TRAINING**

- A. Provide a minimum of 4 hours of training as specified in Section 01821 – Training.

**-END OF SECTION-**

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

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**Section 02839**  
**MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section specifies requirements for the design and construction of Mechanically Stabilized Earth Retaining Walls. The Contractor shall be responsible for both the design and construction of the wall. This work shall consist of furnishing materials and placements of mechanically stabilized earth walls constructed in accordance with these Specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the Contract Drawings or otherwise established.
- B. The mechanically stabilized earth walls shall consist of a non-structural leveling pad, concrete-facing panels, and soil reinforcement elements mechanically connected to each facing panel. Soil reinforcement shall have sufficient length, strength, and frictional resistance as required by the design outlined in these Specifications. The face panels shall be cruciform in shape and shall have a smooth concrete finish to match the finish of the abutment.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Association of State Highway and Transportation Officials (AASHTO):
    - a. AASHTO Standard Specifications for Highway Bridges, 16<sup>th</sup> Edition, 2002.
    - b. AASHTO T-99, The Moisture-Density Relations of Soils Using a 5.5 lb (2.5kg) Rammer and a 12 in. (305mm) drop
    - c. AASHTO T-85, Specific Gravity and Adsorption of Coarse Aggregate
    - d. AASHTO T-22, Compressive Strength of Cylindrical Concrete Specimens
    - e. AASHTO T-24, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete



- f. AASHTO T-23, Making and Curing Concrete Test Specimens in the Field
  - g. AASHTO T-141, Sampling Fresh Concrete
  - h. AASHTO T-236, Direct Shear Tests of Soils Under Consolidated Drained Conditions
2. American Society for Testing and Materials (ASTM):
- a. ASTM A82, Steel Wire, Plain, for Concrete Reinforcement
  - b. ASTM A325, Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - c. ASTM A185, Steel Welded Wire Fabric, Plain for Concrete Reinforcement
  - d. ASTM A123, Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
  - e. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - f. ASTM A570, Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
  - g. ASTM A572, High Strength Low-Alloy Columbium-Vanadium Structural Steel
  - h. ASTM D2000, Classification for Rubber Products in Automotive Applications
  - i. ASTM A1022, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
  - j. ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
  - k. ASTM A276, Standard Specification for Stainless Steel Bars and Shapes
  - l. ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
  - m. ASTM F594, Standard Specification for Stainless Steel Nuts

3. New York State Department of Transportation (NYSDOT):
  - a. Standard Specifications For Highway and Bridges (2002)

#### 1.04 DESIGN AND PERFORMANCE REQUIREMENTS

##### A. General Requirements

1. The Contract Drawings shall provide wall elevations to all bidders showing height of wall structure, length of wall, allowable bearing pressures, and estimated settlements that the wall must be capable of handling. If the wall supplier needs additional information to complete the design, the Commissioner shall be responsible for providing this information in a timely manner prior to bid.
2. All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other appurtenances shown on the Contract Drawings shall be accounted for in the stability design of the wall.
3. The mechanically stabilized earth wall design shall follow the general dimensions of the wall envelope shown in the Contract Drawings. The top of leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be four (4) feet as measured to the top of leveling pad. The top of the face panels shall be at or above the top of leveling pad. The top of the face panels shall be at or above the top of the panel elevation shown on the Contract Drawings. Where coping or barrier is utilized, the wall face panels shall extend up into the coping or barrier a minimum of two (2) inches. The top of the face panels may be level or sloped to meet the top of the wall line noted. Cast-in-place concrete will not be an acceptable replacement for panel areas noted by the wall envelope, except for minor grouting of pipe penetrations and leveling required for coping or traffic barrier.
4. Where walls or wall sections intersect with an angle of 130 degrees or less, a special vertical corner element panel shall be used. The corner element panel shall cover the joint of the panels that abut the corner, and allow for independent movement of the abutting panels.
5. Standard facing panels shall have at least two levels of earth reinforcements to stabilize the panels against rotation. Top and bottom half panels shall have at least one level of earth reinforcements. The wall facing shall be designed to accommodate differential settlement of one foot in 300 feet. The spacing between adjacent panels shall be designed to be 0.25 inches. Joints between panels shall have a shiplap configuration to protect the joint materials from vandalism. There shall be no openings through the wall facing except for

utilities. Where shown on the Contract Drawings, slip joints to accommodate excessive differential settlement shall be included.

- B. Design Requirements: The design by the wall system supplier shall consider the internal stability of the wall mass as outlined below. The external stability of the structure, including slope stability, bearing capacity safety, and total and differential settlement is the responsibility of the City of New York or the City of New York's geotechnical design consultant. External stability of the structure is not the responsibility of the wall system supplier.

1. Failure Plane: The reinforced soil mass shall be analyzed so that the soil stabilizing components extend sufficiently beyond the failure plane to stabilize the material. The mechanical height,  $H_1$ , of an MSE structure is defined as the effective height of the active zone (failure plane) that must be retained by the reinforcements. The mechanical height is measured from the top of the leveling pad to the elevation at which the potential failure plane intersects the ground surface. The long-accepted location of the failure plane envelope is defined by a line originating at the toe of wall, climbing at 0.6 horizontal to 1 vertical until it reaches 50% of the mechanical height of the structure. Then the potential failure plane becomes vertical and intercepts the ground surface at a distance of  $0.3H_1$  behind the facing. The mechanical height,  $H_1$ , can be calculated by the following equation:

$$H_1 = H + [(\tan \theta \times .3H)/(1 - .3 \tan \theta)]$$

where,  $H_1$  = mechanical height  
 $H$  = facing height  
 $\theta$  = Angle that the slope on top of the structure makes with the horizontal

When the ground surface is level, the angle of the slope equals zero and  $H_1$  equals  $H$ . In this case, the knee of the potential failure plane is at 50 percent of the facing height above the toe of wall. External loads which affect the internal stability such as those applied through piling, bridge footings, traffic, slope surcharge, hydrostatic and seismic loads, shall be accounted for in the design.

2. Hydrostatic Forces: Unless specified otherwise, when a design high-water surface is shown on the Contract Drawings at the face of wall, the design stresses calculated from that elevation to the bottom of wall must include a 3-foot minimum differential head of saturated backfill. In addition, the buoyant weight of saturated soil shall be used in the calculation of pullout resistance.
3. Backfill: Consider not less than 34 degrees friction angle of the select backfill used in the reinforced fill zone for the internal stability design of the wall. The friction angle shall be determined by the standard direct shear test, AASHTO T-236, utilizing a sample of the material compacted to 95 percent of AASHTO T-99, Methods C or D, at optimum moisture content. Before

construction begins, the borrow selected shall be subject to approval to show conformance with this frictional requirement. Compliance with the test requirements shall be the responsibility of the Contractor. The wall supplier shall furnish a copy of the test results for the backfill to the Commissioner prior to construction. The friction angle of the foundation soils and random backfill may be considered as 30 degrees.

4. Safety Factors: The minimum factors of safety shall be as follows:
  - a. 1.5 against pullout of the reinforcements based on pullout resistance at 0.5-inch deformation for a representative backfill. (i.e. the resulting deformation should not exceed 0.5 inch at 1.5 times the design load).
  - b. 1.5 against sliding of the mass
  - c. 2.0 against overturning of the mass
  - d. 2.0 against panel connection pullout or rupture, and
  - e. 1.5 against a panel connection deformation of 0.5 inch under the maximum allowable reinforcement tension (i.e. the resulting deformation should not exceed 0.5 inch at 1.5 times the design load).
5. Connections: All connections shall be positive, structural connections subject to the same metal loss rates and allowable tension requirements as outlined in Paragraphs 1.04.B.7.g & 1.04B.7.h below. Adequacy and capacity of panel connections shall be demonstrated by providing test data on connections if requested by the Commissioner.
6. Reinforcement Length: The soil reinforcement length shall be the same from top to bottom of each wall section. The reinforcement length defining the width of the entire reinforced soil mass may vary with wall height along the length of wall. For walls with level or sloped surcharge, the minimum length embedded in the soil shall be seventy percent of the facing height H, or 8 feet, whichever is greater.
7. State of Stress and Pullout Resistance
  - a. The lateral earth pressure to be resisted by the reinforcements shall be calculated using the appropriate coefficient of earth pressure,  $K$ , based on the type of reinforcement used times the vertical soil stress at each reinforcement layer. The vertical soil stress shall be calculated using the Meyerhof method. For ribbed or ladder reinforcing strips, the earth pressure shall vary from  $1.5 \times K_a$  at the top of the structure to  $1.0 \times K_a$  at a depth of 20 ft. For wire mesh and bar mat reinforcements, the earth pressure shall vary from  $2.0 \times K_a$  at the top of structure to  $1.5 \times K_a$  at a depth of 20 ft., and it will remain constant (at  $1.5 \times K_a$ ) below a depth of 20 ft.
  - b. The soil reinforcement length shall be sufficient to satisfy the above requirements, sliding, overturning and pullout factors of safety and the

minimum lengths required for external stability as recommended by the City of New York. Calculation of stresses and pullout factors of safety shall be in accordance with the 2002 AASHTO Specifications for Highway Bridges.

- c. For ribbed or ladder reinforcing strips, the maximum apparent coefficient of friction,  $f^*$ , shall be as follows:

Uniformity Coefficient ( $C_u$ ) of Select Granular Backfill	Maximum $f^*$
< 2	1.2
2 - 7	1.5
> 7	2.0

- d. This maximum may be used at the top of the structure and shall vary to a value not exceeding  $\tan \phi$  at a depth of 20 ft., and it will remain constant ( $\tan \phi$ ) below a depth of 20 ft. A maximum  $f^*$  value of 2.0 is justified when using crushed stone backfill with a uniformity coefficient less than 7.
- e. For wire mesh or bar mat reinforcement, the maximum anchorage factor,  $A_c$ , shall be 30 at the top of the structure and shall vary to 15 at a depth of 20 ft., and it will remain constant at 15 below a depth of 20 ft. The top of the structure is established as the elevation at the upper limit of the mechanical height,  $H_1$ .
- f. The actual applied bearing pressures under the stabilized mass for each reinforcement length shall be clearly indicated on the design drawings developed by wall manufacturer. Passive pressure in front of the wall mass shall be assumed to be zero for design purposes. Calculations for stresses and factors of safety shall be based on assumed conditions at the end of the design life. The design life shall be 75 years unless otherwise indicated on the Contract Drawings.
- g. Allowable Reinforcement Tension: For determination of the allowable reinforcement tension, the following metal loss rates shall be assumed:

Zinc (first 2 years):	15 microns/year/side
Zinc (subsequent years to depletion):	4 microns/year/side
Carbon Steel (after depletion of zinc):	12 microns/year/side
Carbon Steel (75 to 100 years):	7 microns/year/side
Stainless Steel, Grade 316L (first 10 years):	0.5 mil/year
Stainless Steel, Grade 316L (subsequent years):	0.5 mil/year

- h. The allowable tensile stress in steel reinforcements and connections including tie strips and loop inserts,  $F_t$ , at the end of the service life, shall conform to the following:

(1) Stainless steel soil reinforcement:

Reinforcing strips =  $0.55 f_y$  at the end of the design life and  $0.50 f_u$  at net section of bolted connection.

Reinforcing mesh =  $0.47 f_y$  at the end of design life.

(2) Systems with ribbed or ladder reinforcing strips (Not Stainless Steel):

$F_t = 0.55 F_y$  at the reduced gross section (minimum cross section)

$F_t = 0.50 F_u$  at the net section at bolt hole.

(3) Systems with bar mats or welded wire mesh (Not Stainless Steel):

$F_t = 0.48 F_y$  at all sections.

(4) For ladder strips, bar mats and welded wire mesh reinforcements, the gauge of the wires or bars shall be the same in both the longitudinal and transverse directions.

(5)  $F_y$  used for design shall not exceed 65 ksi. The maximum allowable tension in the reinforcements shall consider any reduction in cross sectional area of reinforcements due to punching, and corrosion losses, and shall not exceed 50% of the pullout capacity of the connection devices embedded in the facing panels.

## 1.05 SUBMITTALS

- A. The Contractor shall submit design computations and design drawings in accordance with the General Conditions and Section 1330 - Shop Drawings. Approval from the Commissioner shall be obtained prior to beginning construction.
- B. The design drawings shall include all details, dimensions, quantities and cross-sections necessary to construct the wall and shall include but shall not be limited to the following:
1. An elevation view for each wall shall include the top of wall elevation at all horizontal and vertical break points and at least every 50 feet along the face of wall, the elevation of all steps in the leveling pads, the designation as to the type of panel, the length of soil reinforcing elements, the distance along the face of the wall to where changes in length of the soil reinforcing elements

- occur; and an indication of the final ground line and maximum calculated bearing pressures.
2. A typical cross section or cross sections showing the elevation relationship between ground conditions and proposed grades.
  3. General notes pertaining to design criteria and wall construction.
  4. A listing of the summary of quantities for each wall.
- C. All panel details shall show all dimensions necessary to construct the element, all reinforcing steel in the element, and the location of soil reinforcing connection devices embedded in the panels.
- D. Clearly indicated details for construction of walls around drainage facilities.
- E. Details of the architectural treatment.
- F. The details for diverting soil reinforcements around obstructions such as piles, catch basins and other utilities.
- G. The details for connections between the concrete panel and the soil reinforcements.

## PART 2 PRODUCTS

### 2.01 RETAINING WALL SYSTEM

- A. The mechanically stabilized earth retaining wall system used shall be the product manufactured by the Reinforced Earth Company of North Reading, Massachusetts, or an approved equal.

### 2.02 MATERIALS

- A. The Contractor shall make his own arrangements to purchase the materials covered by this Section of the Specifications, including concrete facing panels, reinforcing mesh, grid or strips, attachment devices, fasteners, joint materials and all necessary incidentals from one of the approved wall system suppliers. The Contractor, or the supplier as his agent, shall furnish the Commissioner with a Certificate of Compliance certifying that the applicable materials comply with this Section of the Specifications. Materials not conforming to this Section of the Specifications shall not be used without the written consent of the Commissioner.
- B. Concrete facing panels shall have a minimum thickness of 5-1/2 inches and a minimum concrete cover on reinforcing steel of 1-1/2 inches. Cement shall be Types I, II or III and shall conform to the requirements of AASHTO M-85. Concrete shall have a compressive strength at 28 days in accordance with Section 2.01.I, Compressive Strength. Additives containing chloride shall not be used

without the approval of the Commissioner. Attachment devices and lifting devices shall be set in place to the dimensions and tolerances shown on the Contract Drawings and called out in these Specifications prior to casting.

- C. **Testing and Inspection:** Acceptability of the precast units shall be determined on the basis of compressive strength tests and visual inspection. The precast units shall be considered acceptable regardless of curing age when compressive strength test results indicate that the compressive strength will conform to the 28-day requirement. The Contractor, or his supplier, shall furnish facilities and perform all necessary sampling and testing in an expeditious and satisfactory manner. Panels utilizing Type I or II cement shall be considered acceptable for placement in the wall when the seven-day initial strength equals or exceeds 85 percent of the 28-day requirement.
- D. **Casting:** The panels shall be cast face down in level forms supported on a flat working surface. Guides shall be used to locate and support attachment devices set in the back face of the panel. The concrete in each panel unit shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by such hand tamping as may be necessary to force the concrete into the corners of the forms and to prevent the formation of stone pockets or cleavage planes. Clear form oil or release agent shall be used throughout the casting operation.
- E. **Curing:** The units shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength. Any production lot that does not conform to the strength requirements of Section 2.01 I, Compressive Strength, shall be rejected.
- F. **Removal of Forms:** The forms shall remain in place until they can be removed without damage to the unit.
- G. **Concrete Finish:** Unless otherwise indicated on the Contract Drawings or elsewhere in the Specifications, the concrete surface for the front face shall have an ordinary steel form finish, and for the rear face an unformed finish. The rear face of the panel shall be free of open pockets of aggregate and surface distortions in excess of 1/4 inch.
- H. **Tolerances:** All units shall be manufactured within the following tolerances with respect to the dimensions shown on the shop drawings:
  - 1. **Attachment Device Locations and Alignment --** Lateral position of reinforcing strip attachment devices shall be within one inch. Embedment measured from the back face of the panel shall be within + 1/4 inch, - 2 inch. Bearing surfaces of multiple attachment points for a single soil reinforcing element shall align within 1/16".



2. Panel Dimensions -- All panel dimensions shall be within 1/4 inch. All hardware embedded in the panel with the exception of attachment devices shall be within 1/4 inch.
3. Panel Squareness -- Squareness, as determined by the difference between the two diagonals, shall not exceed 1/2 inch.
4. Panel Surface Finish -- Surface defects on smooth-formed finished surfaces, measured on a length of 5 feet, shall not exceed 5/16 inch.

I. Compressive Strength

1. Acceptance of the concrete panels, with respect to compressive strength, shall be determined on the basis of production lots. A production lot is defined as a group of panels that shall be represented by a single set of compressive strength samples and shall consist of not more than 80 panels or a single day's production, whichever is less.
2. Compressive strength tests shall be performed on 6-inch diameter by 12-inch cylinders prepared in accordance with AASHTO T-23. During the production of the concrete panels, the manufacturer shall randomly sample the concrete in accordance with AASHTO T-141. A single set of compressive strength samples, consisting of a minimum of four (4) cylinders, shall be made for every production lot.
3. For every compressive strength sample, a minimum of two cylinders shall be cured in the same manner as the panels and tested at seven (7) days or less. The average compressive strength of these cylinders, when tested in accordance with AASHTO T-22, will determine the initial strength of the concrete. In addition, a minimum of two cylinders shall be cured in accordance with AASHTO T-23 and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T-22, will determine the compressive strength of the production lot.
4. If the initial strength test result indicates a compressive strength greater than or equal to 4,000 pounds per square inch, then this test result will be utilized as the compressive strength test result for that production lot, and the requirement for testing at 28 days will be waived for that particular production lot.
5. Acceptance of a production lot will be made if the compressive strength test result is greater than or equal to 4,000 pounds per square inch. If the compressive strength test result is less than 4,000 pounds per square inch, the acceptance of the production lot will be based on its meeting the following acceptance criteria in its entirety:

- a. Ninety (90) percent of the compressive strength test results for the overall production shall exceed 4,150 pounds per square inch.
  - b. The average of any six (6) consecutive compressive strength test results, including the one in question, shall exceed 4,250 pounds per square inch.
  - c. No individual compressive strength test result shall fall below 3,600 pounds per square inch.
6. In the event that a production lot fails to meet the specified compressive strength requirements, the production lot shall be rejected. Such rejection shall prevail unless the manufacturer, at his own expense, obtains and submits evidence of a type acceptable to the Commissioner that the strength and quality of the concrete placed within the panels of the production lot is acceptable. If such evidence consists of tests made on cores taken from the panels within the production lot, the cores shall be obtained and tested in accordance with AASHTO T-24.

J. Acceptance Criteria

1. Precast panels shall be accepted for use in wall construction provided the concrete strength meets or exceeds the minimum compressive strength requirement, the soil reinforcement connection devices and the panel dimensions are within tolerances and any chipping, cracks, honeycomb or other defects are within acceptable standards for precast concrete as determined by the Commissioner.
2. It is recognized that certain cracks and surface defects are not detrimental to the structural integrity of the panel if properly repaired. The Commissioner shall determine the need for and proper method of such repair. All repairs shall be approved by the Commissioner prior to acceptance of the panel for use in wall construction.

K. Marking: The date of manufacture, the production lot number, and the piece-mark shall be clearly marked on the side of each panel.

L. Handling, Storage and Shipping: All units shall be handled, stored and shipped in such a manner as to minimize the danger of chipping, cracks, fractures and excessive bending stresses. Panels shall be stored and shipped in stacks, front face down. Firm blocking, of sufficient thickness to prevent the attachment devices from contacting the panel above, shall be located immediately adjacent to the attachment devices. Lifting inserts shall be installed on the top edge of the precast panels to permit lifting at the project site. Reinforcement connection inserts (tie strips or loop inserts) shall not be used for lifting or handling the panel.

## 2.03 SOIL REINFORCING AND ATTACHMENT DEVICES

- A. All reinforcing and attachment devices shall be carefully inspected to insure they are true to size and free from defects that may impair their strength and durability.
- B. The following criteria apply to wall panels, straps and connections below the 100-year flood elevation (EL. 11.50 feet).

## General:

- 1. All metal connections and metallic soil reinforcement shall be stainless steel.
- 2. If a panel is partially below the 100 year flood elevation, the entire panel and all connections and soil reinforcement shall comply with requirements of this section.
- 3. The proprietary wall company is to determine if different strap and connection sizes are required due to the substitution of stainless steel with black steel. However, the proposed sizes of stainless steel elements will not be less than the sizes of the pre-approved black steel.
- 4. Lifting inserts shall be stainless steel.
- 5. Cover to rebar shall be 3-inches. Thickness of panels will be sized accordingly.
- 6. Transition from thicker panels with the 3 inch cover to the panels with the 2 inch cover will be such that the outer face of the panel will be flush. The panel joints will be detailed accordingly.

## Materials:

- 1. The stainless steel reinforcing mesh shall be per ASTM A1022, Type 316.
  - 2. The stainless steel straps shall be per ASTM A240, Type 316.
  - 3. Connections shall be per ASTM A276, ASTM F593 and F594. Steel for all connections shall be Type 316.
- C. Ribbed Reinforcing Strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to ASTM A572 grade 65 (AASHTO M-223) or equal. Galvanizing shall conform to the requirements of ASTM 123 (AASHTO M-111). The minimum coating thickness shall be 2 oz/SF.
  - D. Ladder Reinforcing Strips shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A82 and welded into the finished strip configuration in accordance with ASTM A185. The longitudinal and transverse wires shall be of the same size. Galvanizing shall be applied after the ladder strips are fabricated and shall conform to the minimum requirements of ASTM A123 (AASHTO M-111). The minimum coating thickness shall be 2 oz/SF.

- E. Reinforcing Mesh and Bar Mats shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A82 and welded into the finished mesh fabric in accordance with ASTM A185. The longitudinal and transverse wires shall be of the same size. Galvanizing shall be applied after the mesh is fabricated and shall conform to the minimum requirements of ASTM A123 (AASHTO M-111). The minimum coating thickness shall be 2 oz/SF.
- F. Tie Strips shall be shop fabricated of hot rolled steel conforming to the minimum requirements of ASTM A-570, Grade 50 or equivalent. Galvanizing shall conform to the minimum requirements of ASTM A-123 (AASHTO M-111), or ASTM A153 (AASHTO M-232). The minimum coating thickness shall be 2 oz/SF.
- G. Wire Tie Strips and loop inserts shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A82. Galvanizing shall conform to the minimum requirements of ASTM A123 (AASHTO M-111). The minimum coating thickness shall be 2 oz/SF.
- H. Fasteners shall consist of hexagonal cap screw bolts and nuts conforming to the minimum requirements of ASTM A325 (AASHTO M-164) or equivalent. Galvanizing shall conform to the minimum requirements of ASTM A153 (AASHTO M-232).
- I. Connector Bars and Pins shall be fabricated from cold drawn steel wire conforming to the minimum requirements of ASTM A82 and shall be galvanized in accordance with the requirements of ASTM A123 (AASHTO M-111). The minimum coating thickness shall be 2 oz/SF.
- J. Structural Plate Connectors and fasteners used for yokes to connect reinforcements to wall panels around pile or utility conflicts shall conform to the material requirements of Tie Strips and Fasteners, Items 4 and 6, stated above.

#### 2.04 JOINT MATERIALS

- A. Installed to the dimensions and thickness in accordance with the Contract Drawings or approved shop drawings.
- B. Bearing pads shall be EPDM rubber pads conforming to ASTM D2000 M2AA 807, having a durometer hardness of 80±5.
- C. Joint Cover: Horizontal and vertical joints between panels shall be covered by a geotextile. The geotextile may be either a non-woven needle punched polyester geotextile or a woven monofilament polypropylene geotextile as approved by the wall supplier. Adhesive used to hold the geotextile filter fabric material to the rear of the facing panels prior to backfill placement shall be approved by the wall supplier.

## 2.05 SELECT GRANULAR BACKFILL MATERIAL

- A. Materials for Select Fill: Use gravel, crushed stone, limestone screenings or other granular or similar material as approved which can be readily and thoroughly compacted to not less than 95 percent of the maximum dry density obtainable by ASTM D1557.

1. Provide select fill that complies with the following gradation limits (Coarse Aggregate Size No. 57):

U.S. Standard Sieve	Percent Passing By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
#4	0-10
#8	0-5

2. Very fine sand, uniformly graded sands and gravels, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

- B. In addition, the backfill shall conform to all of the following requirements where placed for the MSE Wall:

1. Plasticity Index: The Plasticity Index (P.I.), as determined by AASHTO T-90, shall not exceed 6.
2. Soundness: The material shall be substantially free of shale or other soft, poor durability particles. The material shall have a magnesium sulfate soundness loss of less than 30 percent after four (4) cycles, as determined by AASHTO T-104.
3. Electrochemical Requirements: The backfill material shall conform to the following electrochemical requirements:

Property	Requirement	Test Methods
Resistivity	Minimum 3000 ohm-cm, at 100% saturation	ASTM G-57-78 AASHTO T-288-91I
PH	Acceptable Range 5-10	ASTM G-51-77 AASHTO T-289-91I
Chlorides*	Maximum 100 ppm	ASTM D-512-88 AASHTO T-291-91I

Property	Requirement	Test Methods
Sulfates*	Maximum 200 ppm	ASTM D-516-88 AASHTO T-290-91I

\* If the minimum resistivity exceeds 5000 ohm-cm, at 100% saturation, the need for testing of chlorides and sulfates is waived.

- C. The Contractor shall furnish to the Commissioner a Certificate of Compliance certifying that the select granular backfill material complies with this Section of the Specifications. A copy of all test results performed by the Contractor, which are necessary to assure compliance with the Specifications, shall also be furnished to the Commissioner.
- D. Backfill not conforming to this Specification shall not be used without the written consent of both the Commissioner and the wall supplier.

### PART 3 EXECUTION

#### 3.01 CONSTRUCTION REQUIREMENTS

- A. The Contractor's method of construction shall closely follow the construction procedure outlined in the contract documents and these Specifications. Inspection of the method of construction will be provided by the Commissioner. Inspection is not the responsibility of the wall system supplier.
- B. Wall Excavation: Unclassified excavation shall be in accordance with the requirements of the Section 02316 – Excavation, and in reasonably close conformity with the limits shown on the Contract Drawings.
- C. Foundation Preparation
  - 1. The foundation for the structure shall be graded level for a width equal to or exceeding the length of the soil reinforcements, or as shown on the Contract Drawings. Prior to wall construction, the foundation, if not in rock, shall be compacted as directed by the Commissioner. Any foundation soils found to be unsuitable shall be removed and replaced as directed by the Commissioner.
  - 2. At each panel foundation level, an un-reinforced concrete leveling pad shall be provided as shown on the Contract Drawings. The leveling pad shall have nominal dimensions of 6-inch thickness and 12-inch width, and shall be cast using minimum 2,000 psi 28-day compressive strength concrete. The leveling pad shall be cast to the design elevations as shown on the Contract Drawings. Allowable elevation tolerances are +0.01 foot (1/8 inch), and -0.02 foot (1/4 inch), from the design elevation.
- D. Wall Erection: Precast concrete panels shall be placed vertically with the aid of a light crane. For erection, panels shall be handled by means of lifting devices set

Mechanically Stabilized Earth (MSE) Retaining Walls

into the upper edge of the panels. Panels shall be placed in successive horizontal lifts in the sequence shown on the Contract Drawings as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in a vertical position by means of shoulder clamps to adjacent panels and temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. External bracing is required for the initial lift. Vertical and horizontal alignment tolerances shall not exceed 3/4 inch in 10 feet. The overall vertical tolerance of the wall (plumbness from top to bottom) shall not exceed 3/4 inch per 10 feet of wall height.

E. Placement of Reinforcements: Prior to placing the first layer of reinforcements (strips, mats or grids), backfill shall be placed and compacted in accordance with Section 3.01F, Backfill Placement.

1. Bending of reinforcements in the horizontal plane that results in a kink in their alignment shall not be allowed. Gradual bending in the vertical direction that does not kink the reinforcements is allowable.
2. Connection of reinforcements to piles or bending of reinforcements around piles shall not be allowed. Cutting of reinforcement longitudinal bars shall not be allowed to avoid conflicts with piles or utility obstructions. A structural connection (yoke) from the wall panel to the reinforcement shall be used whenever it is necessary to avoid cutting or excessive skewing of reinforcements due to pile or utility conflicts.
3. Soil reinforcements shall be placed normal to the face of the wall, unless otherwise shown on the Contract Drawings or directed by the Commissioner. If skewing of the soil reinforcements is required due to obstructions in the reinforced fill, rotatable connections shall be used and the maximum skew angle shall not exceed 15 degrees from the normal position unless specifically addressed in design calculations that justify that the skewed reinforcements are adequate.

F. Backfill Placement

1. Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing panels. Any wall materials which become damaged or disturbed during backfill placement shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Commissioner. Any backfill material placed within the reinforced soil mass which does not meet the requirements of this specification shall be corrected or removed and replaced at the Contractor's expense, as directed by the Commissioner.
  - a. Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T-99, Method C or D.

2. The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-99, Method C or D.
3. The frequency of sampling of select granular backfill material, necessary to assure gradation control throughout construction, shall be as directed by the Commissioner.
4. The maximum lift thickness after compaction shall not exceed 10 inches, regardless of the vertical spacing between layers of soil reinforcements. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density. Prior to placement of the soil reinforcements, the backfill elevation, after compaction, shall be 2 inches above the attachment device elevation from a point approximately 12 inches behind the back face of the panels to the free end of the soil reinforcements, unless otherwise shown on the Contract Documents.
5. Compaction within 3 feet of the back face of the panels shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. The specified lift thickness shall be adjusted as warranted by the type of compaction equipment actually used, but no soil density tests need be taken within this area. Care shall be exercised in the compaction process to avoid misalignment of the panels or damage to the attachment devices. Heavy compaction equipment shall not be used to compact backfill within 3 feet of the wall face.
6. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to direct runoff of rainwater away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

-END OF SECTION-



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**Section 02890**  
**TRAFFIC SIGNALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Traffic signals shall consist of traffic lights, poles, base castings, base covers, and all mounting equipment and appurtenances. Traffic lights shall perform the following functions:
  - 1. Control traffic entering and exiting from the inbound scale in either direction.
  - 2. Control traffic entering and exiting from the outbound scale in either direction.
  - 3. Indicate open tipping bays.

**1.02 SYSTEM DESCRIPTION**

- A. Design Requirements: Traffic signals shall meet the requirements of the New York State Department of Transportation, Section 724 except as specified herein.

**1.03 SUBMITTALS**

- A. Contractor shall submit working drawings, shop drawings, and material specifications for approval in accordance with Section 01300 – Shop Drawings.
- B. Shop Drawings
  - 1. Manufacturer's catalog cuts and drawings showing all technical information and construction details, including dimensions, type of wiring, weight, and size.
  - 2. Lamp type and technical information.
  - 3. Pole and base construction details.
  - 4. Bill of materials.
  - 5. Submit certification of compliance with NYS DOT standards.
- C. Provide Operation and Maintenance manuals in accordance with Section 01831 - Operation and Maintenance Manuals.

**1.04 QUALITY ASSURANCE**

- A. Reference Standards: The following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern nomenclature; and define parameters of configuration and construction, in addition to specific details in this specification:
  - 1. AASHTO, American Association of State Highway and Transportation Officials
  - 2. ITE, Institute of Transportation Engineers

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, and handle all products and materials as specified in Section 01651 – Transportation and Handling of Materials and Equipment, and Section 01661 – Protection of Materials and Equipment.
- B. Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting the requirements of the approved shop drawings.
- C. Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Protect from harm in accordance with the manufacturer's recommendations.

**1.06 PROJECT CONDITIONS**

- A. Project Environmental Requirements: Design and construct the system for continuous operation under the following temperature and humidity conditions:
  - 1. Indoor locations
    - a. Tipping Floor: Similar to outdoor locations
  - 2. Outdoor locations
    - a. Ambient Temperature: -10 to 120 degrees F
    - b. Relative Humidity: 100 percent maximum
  - 3. Where required, provide thermal enclosures equipped with thermostatically controlled space heaters.

**1.07 SPARE PARTS**

- A. Provide spare parts in accordance with Section 01750 – Spare Parts and Maintenance Materials.

- B. Furnish and deliver spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification Section.
- C. The following shall constitute the minimum spare parts:
  - 1. All standard recommended spare parts, as indicated in the equipment manufacturer's instructions manual for each component of the system.
  - 2. Furnish the following complete spare units:
    - a. One optical system of each type and color supplied
    - b. One dozen of each type and size of fuse used.

## PART 2 PRODUCTS

### 2.01 TRAFFIC LIGHTS

#### A. Housing

- 1. Material of Construction: Polycarbonate
  - a. Heat-resistant to the signal lamp
  - b. UV and heat stabilized
  - c. Flame retardant
- 2. Signal Size: As shown
- 3. Signal Type: Circular or square as shown
- 4. Housing, Door and Visor Color: Black
- 5. Door Hardware: Stainless steel
- 6. Visor Style: Cap-type

#### B. Optical System

- 1. Reflector: Specular aluminum
- 2. Lens
  - a. Material of Construction: Polycarbonate, conforming to ITE standards
  - b. UV resistant

## 3. Lens Types

- a. Circular: Red, green
- b. Square: Lane control type: Red "X", green arrow

## 4. Lamps

- a. Power: 120 Vac
- b. Type: LED
- c. Chromacity: In accordance with NYS DOT standards
- d. Minimum Luminous Intensity: In accordance with NYS DOT standards

C. Mounting: In accordance with current NYS DOT standards, and as shown.

## D. Manufacturers

- 1. Eagle Traffic Control Systems
- 2. Peek
- 3. US Traffic Corporation
- 4. Or approved equal

## 2.02 TRAFFIC POLES AND APPURTENANCES

- A. Pole Construction: Seamless, round, non-tapered
- B. Pole Materials of Construction: Aluminum
- C. Pole Wall Thickness: No less than 0.125-inch
- D. Pole Finish: Powder coat, dark bronze
- E. Pole Height: As shown
- F. Pole Diameter: 4 inches
- G. Pole Mounting: As shown
- H. Pole Wind Design: Meet the outdoor lighting standards wind design requirements of Section 16511 – Lighting of the Electrical Contract.
- I. Pole bases shall be cast aluminum, secured by stainless steel screws.
- J. Provide aluminum pole cap.
- K. Provide embedment of four anchor bolts, with eight nuts and eight washers; all assembled as a template for placement.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Contractor shall mount and install all traffic signals as shown and specified.
- B. Interface with Other Work: The traffic signals adjacent to the inbound and outbound scales shall interface with the scale data management system provided by others (PIN 82704RR00033). Driver Interface Panels provided as part of the scale data management system will include dry contacts, which shall be used to control the traffic signals.
- C. Field Quality Control: Adjust the mounting of the traffic signal assemblies to "aim" to signals towards the vehicle driver.

-END OF SECTION-

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**Section 02891**  
**ALUMINUM SIGN PANELS AND ALUMINUM SIGN POSTS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section specifies requirements for the following:
1. Aluminum sign panels for use in the construction of guide, warning and regulatory roadway signs.

**1.02 REFERENCES**

- A. The following is a listing of the publications referenced in this Section:
1. American Association of State Highway and Transportation Officials (AASHTO)
    - a. A Policy on Geometric Design of Highway and Streets, 5<sup>th</sup> Edition
  2. Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals (LTS-2)
  3. Manual for Signing and Pavement Markings of the National System for Interstate and Defense Highways
  4. American Society for Testing and Materials (ASTM)
    - a. ASTM A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
    - b. ASTM A 193 Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
    - c. ASTM A 194 Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
    - d. ASTM A 325 High-Strength Bolts for Structural Steel Joints
    - e. ASTM A 325 High-Strength Bolts for Structural Steel Joints
    - f. ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate
    - g. ASTM B 211 Aluminum-Alloy Bar, Rod and Wire
    - h. ASTM B 221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes



5. American Welding Society (AWS)
  - a. AWS D 1.2 Structural Welding Code - Aluminum
6. Federal Highway Administration (FHWA)
  - a. Manual on Uniform Traffic Control Devices for Streets and Highway (MUTCD)
7. Federal Highway Administration (FHWA)
  - a. Standard Highway Signs

#### 1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Design of signs, supports and framing shall provide sufficient strength to withstand a wind loading of 80 miles per hour as per AASHTO LTS-2.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. All sign components and materials shall be transported and handled in a manner that shall cause no permanent deformation, injury or damage. Sign components and materials to be stored shall be stored above ground.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the requirements of this Section:
  1. Detailed sign face layout for all sign panels showing letter height, width, brush stroke, spacing between letters, words, symbols and lines, border width, symbols details, and overall dimensions of the sign panels.
  2. Shop drawings of sign panels showing the sizes of the members and their connection details including joining and anchorage, stiffening, and bracing.
  3. Catalog cuts of all the materials to be used for sign faces.
- B. Prior to fabrication, submit computations for the design of the sign panels and supports, as required in 1.03 of this Section, signed by a Professional Engineer licensed in New York State.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Aluminum Sign Panels
  1. Aluminum sheets and plates shall conform to ASTM B 209, alloy 6061-T6.

2. Fabricate panels from standard sheet widths. The thickness for panel sizes of 30 inches by 30 inches or smaller shall be 0.080 inch and the thickness of larger panels shall be 0.125 inch unless otherwise shown on the Contract Drawings.
3. The panel blanks shall be free from laminations, blisters, open seams, pits, holes, or defects that may affect their strength, appearance or use. The thickness shall be uniform and the blanks shall be commercially flat.

**B. Panel Sheeting and Screen Printing**

1. Reflectorized Sheeting: Scotchlite Brand High Intensity Grade Series 2800 (heat activated adhesive) or Series 3800 (pressure sensitive adhesive) as manufactured by the Traffic Control Materials Division of the 3M Co., 223-3N 3M Center, St. Paul, Minnesota 55144, or approved equal, and shall meet or exceed the reflecting requirements associated with High Intensity Grade sheeting.
2. Non-Reflectorized Sheeting: Scotchcal Brand film Series 650 (heat activated adhesive) or Series 3600 (pressure sensitive adhesive) as manufactured by the Traffic Control Materials Division of the 3M Co., or approved equal.
3. Screen Printing Inks, Thinners and Toners
  - a. Scotchlite Brand Process Colors Series 700 for use on Reflectorized Sheeting, or approved equal
  - b. Scotchcal Brand Process Colors Series 3900 and 4100 for use on Non-Reflectorized Sheeting, or approved equal
4. Panel sheeting (reflective or non-reflective) and screen printing usage shall be as shown on the Contract Drawings.

**C. Stiffeners, Brackets and Miscellaneous Hardware**

1. Horizontal and vertical sign panel stiffeners (Z bars) and panel brackets shall be fabricated of aluminum alloy 6061-T6 conforming to ASTM B 221.
2. Other miscellaneous aluminum hardware including bolts, nuts, washers, screws, rivets, pull-type lockbolts and serrated or knob stem blind rivets shall be fabricated to meet the requirements of ASTM B 209 and B 211 for Alloy 2024-T4. Component designated as Alloy 2024-T4 shall be given an chromated sealed anodic coating.
3. High strength steel bolts, nuts and washers shall conform to ASTM A 325. High-strength bolts, nuts and washers shall be galvanized in accordance with ASTM A 153.

4. Stainless steel nuts shall conform to ASTM A 194, Grade 8F, except that the nuts shall be lock nuts with semifinished hex nuts equivalent to American Standard Heavy Series. Stainless steel bolts, washers, and screws shall conform to ASTM A 193, austenitic steel.

## 2.02 CONSTRUCTION FEATURES

- A. Sign face text, symbol, and border layouts shall be in accordance with the Contract Drawings and conform to the following requirements of:
  1. MUTCD
  2. Standard Highway Signs
- B. Sign characters shall be as shown on the Contract Drawings.
- C. Sign corner and border radii shall be approximately one-eighth (1/8) of the height of the sign but shall not exceed 12 inches; or as shown in the FHWA Standard Highway Signs. Sign borders shall be of the same type character as the legend and shall be approximately the same width as the stroke width of the major lettering or the sign; or as shown in the FHWA Standard Highway Signs.

## 2.03 FABRICATION

- A. All shearing, cutting and punching shall be performed prior to preparing the blanks for application of reflective material. All edges and corners shall be filed or ground smooth, leaving the entire sign blank free from sharp edges and burrs.
- B. The blanks shall be cleaned, degreased, and chromated or otherwise properly prepared in accordance with the sheeting manufacturers recommendations. After treatment, clean cotton gloves shall be used in handling the sign blank until the reflective sheeting is applied. All fabrication except for cutting the lower ends of embedded posts shall be done in the shop. The aluminum panels shall be clean, dry, and free from oils, dust, grit, or any other contaminants that would adversely affect the adhesion of the Reflectorized and Non-Reflectorized sheeting.
- C. Welding of aluminum shall consist of inert gas shielded metal arc welding with consumable electrodes. All welding of aluminum shall be performed in the shop. No field welding or aluminum shall be permitted. All welders shall be qualified in accordance with the qualification procedures of AWS D 1.2.
- D. Necessary drilling of holes required for shop and field assembly after sheeting is applied shall be done such that the drill bit does not snag, rip, or damage the sheeting outside of the drill hole. Holes shall be deburred prior to assembly.
- E. Exposed bolt heads on the face of the assembly sign shall be touched up with enamel paint of the same color as the sheeting surrounding the bolts.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Erect, cover, and remove signs as shown on the Contract Drawings.
- B. Side-of-road ground mounted signs shall be erected so that the sign face is truly vertical to the profile line and the intersection angle measured between the sign face and the centerline of the travel lane, which the sign serves shall be 93 degrees. Where lanes divide or curve, sign faces shall be oriented so as to be most effective both day and night, and to avoid the possibility of specular reflection.
- C. Except where otherwise specified, parking signs shall be placed facing approaching traffic at an angle of between 30 and 45 degrees with the line of traffic flow.
- D. All sign panels shall be securely fastened to their supports with bolts, nuts and washers of aluminum (2024-T4 alloy), hot-dip galvanized steel, or stainless steel conforming to 2.01 C, and 1.03 of this Section.
- E. Horizontal and vertical sign clearances shall be as shown on the Contract Drawings.

#### 3.02 FIELD INSPECTION

- A. Immediately prior to erection, all material will be inspected by the Commissioner for damage which is attributable to improper transportation, handling or storage procedures.
- B. An inspection of each completely erected sign shall be made in the daylight for proper location, line and grade of signs, vertical post alignment, condition, appearance and visibility. The completely erected signs may also be inspected at night by the Commissioner.
- C. As the Work progresses, the location, position and condition of all signs shall be monitored by the Commissioner.
- D. Any deviation from the above indicated procedure shall be approved by the Commissioner.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 02910  
GENERAL PLANTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work includes but is not limited to the following:
1. Furnishing and installing new seeded lawns.
  2. Furnishing and installing mulch.
  3. Protection and maintenance of all seeded areas until Substantial Completion.
  4. Maintenance of seeded areas during the 24-month guarantee period.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 – Shop Drawings
- B. Section 02316 – Excavation
- C. Section 02317 - Backfilling
- D. Section 02371 - Dust, Soil Erosion & Sedimentation Control
- E. Section 02920 - Soil Mixes

**1.03 SUBMITTALS**

- A. All submittals, including the following, shall be as specified in Section 01330 - Shop Drawings.
- B. Samples: Submit samples of the following items:
1. Mulch: One (1) pound bag
- C. Product Data
1. Submit analysis of each seed mix to be used, showing percentage of purity, weed content and germination of seed.
  2. Submit certified analysis for each treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged material.
- D. Maintenance Program: Submit written schedule of maintenance operations proposed for the guarantee period. Schedule shall be in the form of a list of each maintenance operation, with dates showing when each maintenance task will be performed, and the frequency of occurrence.

**1.04 REGULATORY REQUIREMENTS**

- A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary for work to comply with such requirements at no additional cost to City of New York.
- B. Procure and pay for permits and licenses required for work of this Section. Obtain all required permits in a timely manner to avoid delays to the work.

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver packaged materials in unopened bags or containers, each clearly bearing the name of the producer, the material composition, manufacturers' certified analysis, and the weight of the material
- B. All packaged products shall be stored, handled and applied in strict accordance with manufacturers' instructions.

**1.06 COORDINATION**

- A. The Contractor shall coordinate his work with that of other Contractors. Such coordination shall include, but not be limited to:
  - 1. Location of all underground utility lines and structures
  - 2. Scheduling of seeding operations
  - 3. Scheduling of maintenance operations

**1.07 SUBSTANTIAL COMPLETION**

- A. Contractor shall submit a written request to the Commissioner, for a formal inspection of the planting work for Substantial Completion.
- B. At the time of inspection all plant material must be alive, healthy, and installed as specified to be accepted.
  - 1. If plants are dead, dying, unhealthy, or not serving their visual function in the landscape scheme in the opinion of the Commissioner, or if workmanship is unacceptable, written notice will be given to the Contractor in the form of a punch list which itemizes all remedial work required for Substantial Completion.
  - 2. This work may include plant replacement or maintenance and must be carried out prior to issuance of the Certificate of Substantial Completion.

## 1.08 GUARANTEES

- A. All new plant material shall be guaranteed for a period of 24 months after the date of Substantial Completion.
- B. Maintenance
  - 1. Contractor shall submit a written maintenance program and schedule to the Commissioner for approval.
  - 2. Maintenance program shall be revised and resubmitted as required until approved by Commissioner.
  - 3. During the guarantee period, the Contractor shall maintain all plant materials as specified herein, and as noted in the approved maintenance schedule, and shall replace, at no additional cost to the City of New York, any and all plant material that has died or, in the opinion of the Commissioner, is in unhealthy or unsightly condition.
- C. Vandalism: Contractor will not be held responsible for acts of vandalism occurring after the beginning of guarantee period.
- D. Site Inspection
  - 1. Approximately one month prior to the expiration of the guarantee period, the Contractor shall arrange a site inspection by the Commissioner.
  - 2. At this time the Commissioner will prepare a list of all remedial work required, including plant replacement or maintenance.
  - 3. This work shall be carried out before the end of the guarantee period, unless weather conditions cause delays, in which case such work shall be carried out as soon as is practical.
- E. Final Acceptance
  - 1. Following the completion of all remedial work and replacement plantings, the Contractor shall request the Commissioner in writing for a formal inspection of the landscape work for Final Acceptance.
  - 2. If replacement plantings are required, Final Acceptance will be provisional upon a final inspection at the end of the guarantee period for the plant replacements.
- F. All of the materials and labor required for maintenance and replacements during the guarantee period shall be included in the Contractor's bid price. No additional payments will be made therefor.



**PART 2 PRODUCTS****2.01 DRAINAGE GRAVEL**

- A. Drainage fill shall conform to the requirements of Specification 02317 - Backfilling, and shall be clean, free from silt and organic materials.

**2.02 MULCH**

- A. Mulch shall be double-shredded bark, as approved. Mulch shall be partially decomposed, dark brown in color, free from sawdust, and any material over three (3) inches in length.

**2.03 GRASS SEED**

- A. Grass seed shall be fresh recleaned seed of the latest crop. Seed mixture shall have the following proportions by weight:
  - 1. 60% Nassau Kentucky Bluegrass
  - 2. 20% Jamestown Chewings Fescue
  - 3. 20% Palmer Perennial Ryegrass
- B. Seed shall be Tri-Plex General seed mix by Lofts Seed Inc. (800) 526 3890, or approved equal.
- C. All seed shall be delivered in standard size bags of the vendor, showing weight, purity, and percentage of seed varieties.

**2.04 WATER**

- A. The Contractor shall be responsible for supplying all required water to the site at no additional cost to the City of New York.
  - 1. All work injured or damaged due to the lack of water, or the use of too much water or contaminated water shall be the Contractor's responsibility to correct.
  - 2. Water shall be free from impurities injurious to vegetation.

**PART 3 EXECUTION****3.01 INSPECTION**

- A. Contractor shall inspect the site before bidding to determine the characteristics of the site.

- B. The Contractor shall be liable for all damage to surrounding areas caused by planting operations and shall be required to restore or replace the damaged areas to their original condition.

### 3.02 UTILITIES

- A. Contractor is responsible for determining the location of all utilities, by contacting the appropriate utility company prior to any planting activities.
- B. Verify that underground utilities and irrigation systems in landscape areas are in place, at proper location, tested (except final irrigation testing) and ready for use.
  - 1. Take proper precautions so as not to disturb or damage sub-surface elements.
  - 2. Coordinate with other trades.
- C. Contractor is liable for any damage to such utilities during the course of construction, and is responsible for making necessary repairs to damaged utilities at his own expense.

### 3.03 WATERING

- A. Immediately after installation of each plant, the soil around it shall be thoroughly saturated with water.
  - 1. Apply water slowly so as to penetrate the entire root system.
  - 2. Watering shall continue throughout the maintenance and guarantee period, as frequently as seasonal conditions require, until final acceptance of the work.
  - 3. Contractor shall be responsible for adequate water both before and after installation of irrigation system.

### 3.04 MULCHING

- A. After planting operations are complete all plant bed areas shall be covered with approved mulch.
  - 1. Mulch shall be installed at an even depth of 3 inches.
  - 2. Mulch shall be contained within the plant bed areas and shall not be permitted to spread onto paved areas.

### 3.05 PREPARATION FOR SEEDING

- A. All areas to be seeded shall be thoroughly loosened to a depth of 6 inches and graded to true lines free from all unsightly variations, bumps, ridges or depressions. All sticks, stones, roots or other objectionable material shall be removed.

- B. Provide 12 inches of lawn soil mix, spread evenly over all areas to be seeded. Prepare topsoil to provide a crumbly seedbed, firm and level after tilling.
- C. Apply ground limestone and uniformly work in to top one inch of seedbed. The rate of limestone application shall be dependent on the pH of the soil, as determined by chemical analysis, and shall be as follows:

<b>pH of Soil</b>	<b>Rate: lbs/1000 Square Feet</b>
5.0 to 5.5	100
5.5 to 6.0	50
6.0 to 6.8	25
over 6.8	0

1. Apply commercial fertilizer and uniformly work in to top one inch of seedbed. The rate of application shall be: 20 pounds per 1000 sq. ft.
2. Apply superphosphate and uniformly work in to top one inch of seedbed. The rate of application shall be: 40 pounds per 1000 sq. ft.
3. After all materials have been worked in, firm up soil by rolling to eliminate all soft spots. Rake entire area into a crumbly state, with one inch of loose soil at the surface, using a wide-toothed rake or tine-harrow.

### 3.06 SEEDING OPERATIONS

- A. Apply seed with drop or cyclone spreader to uniformly cover seedbed at the rate of 5 lbs per 1000 sq feet.
- B. Lightly rake seed into soil, and cover entire area with salt hay, to a thickness of one inch.
- C. Water all seeded areas regularly during first 4 weeks following seeding to maintain adequate moisture for deep root growth.
- D. Seeded areas shall be protected during establishment.

### 3.07 WATERING OF SEEDED AREAS

- A. The Contractor shall provide all labor and arrange for all watering necessary to establish acceptable grass stands.
1. Begin watering immediately following installation.
  2. Watering shall continue throughout the contract period until Substantial Completion.

3. During the first two weeks after planting, in the absence of adequate rainfall, watering shall be performed up to 3 times daily or as often as necessary and in sufficient quantities to maintain moist soil to a depth of at least two inches.
  4. After the first two weeks, the Contractor shall water the grass areas to maintain adequate moisture in the upper two inches (2") of soil, necessary for the promotion of deep root growth.
- B. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one (1) complete coverage to the lawn areas in an eight (8) hour period.

### 3.08 RESEEDING

- A. Any areas which fail to show growth within 3 weeks of seeding shall be immediately reseeded at no additional cost to the City of New York.
- B. Reseeding shall be carried out as many times as necessary until a uniform grass cover is established.
- C. Scattered bare spots, none of which are larger than one square foot, will be allowed up to a maximum of 3 percent of any seeded area.

### 3.09 MOWING

- A. Mowing of all seeded lawn areas shall begin when lawn is firmly rooted and secure, and has reached a height of 3 inches, and shall continue until Substantial Completion.
- B. Mow all grass lawn areas to maintain a grass height of between 1-1/2 and 2-1/2 inches.

### 3.10 CLEAN UP

- A. At the end of each work day the Contractor shall broom-clean the site, to remove all trash, debris, and loose soil materials. Store materials and equipment where directed.
- B. Immediately following the completion of planting operations, the Contractor shall remove all excess materials, stock piles, waste material, tools and equipment, and leave the site in a clear and clean condition.
- C. Immediately remove all rejected materials from the site. All rejected materials and other waste or debris shall become the property of the Contractor, who shall legally dispose of same off-site.

-END OF SECTION-

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**Section 02920  
SOIL MIXES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Work Included: This work includes, but is not limited to, the following:
  - 1. Supply of component materials and soil amendments for Soil Mixes from approved off-site sources.
  - 2. Preparation and blending of Soil Mixes.
  - 3. Installation, placement, spreading, and fine grading of Soil Mixes.
  - 4. Testing of all soil component materials, soil amendment materials, and Soil Mixes.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 02371 - Dust, Soil Erosion & Sedimentation Control

**1.03 REFERENCES**

- A. Association of Official Agricultural Chemists
- B. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- C. NYS DEC 6NYRR Subpart 360-5

**1.04 SUBMITTALS**

- A. All submittals, including the following, shall be as specified in Section 01330 – Shop Drawings.
- B. Product Data: Submit manufacturer's technical information, including application instructions where relevant, for the following items:
  - 1. Fertilizers
  - 2. Herbicides
- C. Samples - Soil Mix Components: Each 1 lb. packaged.

1. Topsoil
2. Compost

D. Samples - Blended Soil Mixes: Each 1 lb. packaged.

1. Lawn Mix
2. Structural Soil Mix

E. Test Results - Soil Mix Components: Submit written reports, as specified herein, for each bulk component:

1. Topsoil
2. Sand
3. Compost
4. Crushed Stone

F. Test Results - Blended Soil Mixes: Submit written reports, as specified herein, for each blended soil mix:

1. Lawn Mix
2. Structural Soil Mix

1.05 TESTING

A. Contractor shall submit written test reports.

1. Testing shall be carried out by an independent testing laboratory.
2. Testing laboratory shall be approved by Engineer.
3. All testing required by this Section, or additionally required by Engineer, shall be furnished and paid for by Contractor.
4. Contractor shall be responsible for timely submittal of samples to the testing laboratory.

B. Each test shall be carried out using the categories and sieve sizes as specified herein. Failure to include any of the required criteria will be sufficient cause for rejection of the test.

C. Each test report shall include the following information:

1. Project Title
2. Name of Contractor
3. Name of material supplier
4. Testing Laboratory name, address and telephone number

5. Type of test
  6. Date of test
  7. Test results, including identification of deviations from acceptable ranges
- D. Each sample shall be tested, as applicable, for the following:
1. Mechanical analysis: Sieve method, using sieve sizes specified.
  2. pH
  3. Organic matter content: Percentage of oven-dry weight of soil, determined by loss on ignition of moisture-free sample, dried in accordance with the methods of the Association of Official Agricultural Chemists.
  4. Analysis of soluble salts: Sodium, calcium, magnesium, sulfates, chlorides and bicarbonates, in millimhos per centimeter.
  5. Analysis of minerals: Nitrogen, phosphorus, and potassium, in parts per million.
  6. Analysis of heavy metals: In parts per million.
  7. Corrective recommendations for nutrients and pH
- E. The Engineer may take and analyze at any time, such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested at no additional cost to the City.
- F. No component bulk material for Soil Mix shall be used or blended into a mix, until test reports have been received and approved by the Engineer. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments, until approved.

#### 1.06 REGULATORY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary for work to comply with such requirements at no additional cost to City.
- B. Procure and pay for all permits and licenses required for the Work of this Section.

#### 1.07 DELIVERY AND STORAGE

- A. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.



- B. Packaged Materials: Deliver packaged materials to the location where planting Soil Mixes are to be blended, in unopened bags or containers, each bearing the name and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.
1. All bags shall be protected from water and contamination with other materials.
  2. Retain packages for inspection by Engineer.
  3. All packaged materials shall be stored, handled and applied in strict accordance with manufacturer's instructions.
- C. Stockpiles
1. Stockpiles of on-site or off-site bulk materials and Soil Mixes shall not exceed 50 cubic yards, and shall be no more than 6 feet in height to prevent anaerobic conditions within the piles.
  2. All stock piled materials shall be adequately covered with tarpaulins or otherwise protected to prevent excessive water absorption and blowing by winds, until time of actual use.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. All Soil Mix components shall be tested and approved prior to incorporation into blended Soil Mixes.
- B. Provide adequate quantities of all Soil Mix materials to attain, after compaction and natural settlement, all design finished grades.

### 2.02 TOPSOIL

- A. All topsoil shall consist of natural loam, free from subsoil, obtained from an area which has never been stripped.
1. Topsoil shall be removed to a depth of 12", or less if subsoil is encountered.
  2. Topsoil shall be of uniform quality, free from hard clods, stiff clay, hardpan, sods, roots, chips, sticks, partially disintegrated stone, cement, ashes, slag, concrete, tar residues, tarred paper, boards, or any other undesirable material. No topsoil shall be delivered in a frozen or muddy condition.
  3. Topsoil shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, seeds, or other viable propagules of invasive plants.

Construction and demolitions debris as classified under 6 NYCRR Part 360, other than uncontaminated land clearing debris, shall not be used to amend topsoil.

B. Topsoil shall conform to the following requirements:

1. pH: 5.5 to 7.0
2. Organic content: 4 - 6%

C. Topsoil shall conform to the following mechanical analysis:

Sieve Size	Percent Passing
1"	100
1/4"	90 - 99
# 10	60 - 80
# 40	40 - 60
# 60	40 - 60
# 100	10 - 30
# 200	10 - 20

D. When the topsoil otherwise complies with the requirements of the specification but shows a deficiency of not more than one percent (1%) organic matter content; then humus, compost, or other approved organic matter may be incorporated when or as permitted by the Engineer.

## 2.03 COMPOST

A. Shall conform to the following requirements:

1. Material shall be capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth.
2. Material shall be derived from organic wastes such as food and agriculture residues, composted cow or other animal manures, sewage sludge or other materials that meet the specified requirements.
3. Compost shall be screened, and shall be free of any stones, branches, roots, brush, weeds, or wood chips, and all debris such as plastic fragments, glass, and metal fragments.

B. Compost shall show conformance with the following requirements:

1. Organic content: 50% minimum

2. pH: 5.5 - 8.0
3. Carbon/nitrogen ratio: 25:1 to 35:1
4. Passing 1/2" screen: 100%

C. Heavy metal content shall not exceed the following indicated amounts:

<b>NYSDEC 6NYCRR, Subpart 360-5: Composting Facilities, Section 360-5.10, Table 7 Pollutant Limits- Products</b>		
Parameter	Monthly Average Concentration mg/kg, dry weight	Maximum Concentration mg/kg, dry weight
Arsenic (As)	41	75
Cadmium (Cd)	10	85
Chromium (Cr-total)	1000	1000
Copper (Cu)	1500	4300
Lead (Pb)	300	840
Mercury (Hg)	10	57
Molybdenum (Mo)	40	75
Nickel (Ni)	200	420
Selenium (Se)	100	100
Zinc (Zn)	2500	7500

- D. Compost shall meet requirements for "Monthly Average Concentration" pollutant limits of Table 7, except where the Engineer specifically allows the use of the Maximum Concentration pollutant limits.
- E. No compost shall be delivered until the approval of samples by the Engineer, but such approval does not constitute final acceptance. The Engineer reserves the right to reject, on or after delivery, any material which does not, in their opinion, meet these specifications. When compost is stored on the job, it shall be done as directed by the Engineer.
- F. Certification: Only facilities permitted to compost biosolids under 6 NYCRR Part 360, will be allowed to furnish finished compost for use in topsoil. The certification shall be supplied by the Contractor prior to the delivery of any composted biosolids, topsoil containing sewage sludge, or other such regulated material to the site.

## 2.04 SOIL AMENDMENT MATERIALS

- A. Bonemeal: Shall be finely ground and have the following N-P-K (Nitrogen-Phosphorus-Potassium) analysis: 4-12-0.
- B. Commercial Fertilizer: Shall have the following N-P-K analysis: 10-6-4.
  1. A minimum of 50% of the nitrogen shall be derived from organic sources.
  2. If soil tests indicate need for a different composition, Contractor shall submit proposed alternate fertilizer for approval.

- C. **Controlled-release Fertilizer:** Shall be in granular form and shall have the following N-P-K analysis: 10-6-4.
1. Fertilizer shall be as manufactured by Osmocote, Meister, or other approved manufacturer.
  2. If soil tests indicate need for a different composition, Contractor shall submit proposed alternate fertilizer for approval.
- D. **Limestone:** Shall be granular limestone, produced from Dolomitic limestone specifically for use in planting, with a minimum of 88% of calcium and magnesium carbonates, conforming to the following requirements:

Sieve Size	Percent Passing
# 10	100
# 20	90 minimum
# 100	60 minimum

- E. **Sulfur:** Lower pH if required, by use of elemental sulfur product.
1. Peat moss or copper sulfate may not be used to lower pH.
- F. **Herbicides:** Acceptable products:
1. Post-emergent herbicide, for lawn areas and plant beds: Shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or approved equal.
  2. Pre-emergent herbicide, not to be used at lawn areas or grasses: Shall be Treflan 5G, or approved equal.
- G. **Perlite:** Super-coarse size horticultural perlite.

## 2.05 CRUSHED STONE

- A. Crushed stone for Structural Soil Mix shall consist of clean, sound, tough, durable stone, free from soft, thin or laminated pieces, or vegetable matter or other deleterious substances. Crushed stone shall conform to the requirements of NYS DOT Type 4 Subbase Course materials, and shall meet the following gradations:

Sieve Size	Percent Passing
2"	100
1/4"	30 - 65

Sieve Size	Percent Passing
#40	5 - 40
#80	0 - 5

**2.06 LAWN MIX****A. Lawn Mix for all seeded areas, shall conform to the following requirements:**

1. Organic Matter: 4.5 % minimum
2. pH: 0 - 7.0
3. Soluble salts: Less than 2 millimhos per centimeter
4. Minerals:
  - a. Nitrogen: More than 12 ppm
  - b. Phosphorus: More than 7 ppm
  - c. Potassium: More than 150 ppm

**B. Mix shall consist of the following proportions by volume:**

1. Six parts topsoil
2. Two parts compost
3. Two parts sand
4. One part perlite

**C. The following items shall be added to the above mix:**

1. Five pounds bonemeal per cubic yard of soil mixture.
2. One pound commercial fertilizer per cubic yard of soil mixture.
3. One pound controlled release fertilizer per cubic yard of soil mixture.
4. Two pounds water absorbent polymer per cubic yard of soil mixture, or as recommended by manufacturer.
5. Ground limestone as required for specified pH

**2.07 STRUCTURAL SOIL MIX****A. The components of the structural soil mix shall be blended in the following proportions:**

Component	By Units of Weight
Crushed Stone	100
Planting Soil Mix	16 - 20
Super-absorbent polymer	0.03
Water	10 +/-

1. The quantity of water in the mix shall be adjusted to bring the mix to optimum moisture for compaction, as determined by AASHTO T 99 and ASTM D698.
- B. The ratio of the components in the mix shall be adjusted in accordance with the rodded unit weight of the crushed stone.
- C. If the stone sample porosity is near 40%, the weight of Planting Soil Mix may increase toward 20%. If the stone sample porosity is near 33%, the weight of Planting Soil Mix may decrease toward 14%.
- D. Blending Procedure: The components of the structural soil mix shall be blended as follows:
  1. Mix together the super-absorbent polymer and the water to produce a slurry. Wait at least four hours for hydration.
  2. Place the crushed stone in a truck-mounted rotary concrete mixer, or equivalent sized mixing hopper and set into motion.
  3. Add the water/super-absorbent polymer slurry, and mix until crushed stone is uniformly wetted by slurry.
  4. Add the Planting Soil Mix, and let the drum turn three revolutions, or the minimum needed to auger the soil from the loading access point to the furthest point in the drum.
  5. Deposit the material. The bulk of the mixing will occur during the revolutions of the mixer while the material is augured out.
  6. Do not over-mix. If the Planting Soil Mix begins to pelletize and separate from the crushed stone, the batch shall be discarded.

### PART 3 EXECUTION

#### 3.01 INSPECTION AND COORDINATION

- A. Contractor shall inspect the site before bidding to determine the characteristics of the site and the existing soil in areas to be planted.

1. Prior to construction and soil mix placement operations, the Contractor shall ascertain the location of all existing and proposed electric cables, conduits, irrigation, under-drainage systems and all other underground or at grade utilities, by contacting the appropriate utility company.
  2. Contractor shall take proper precautions so as not to disturb or damage any sub-surface elements.
  3. Contractor shall be liable for any and all damage to such utilities during the course of construction, and shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.
- B. Contractor shall be liable for any and all damage to surrounding areas caused by planting operations and shall be required to restore or replace damage areas to original conditions, to the satisfaction of the Engineer.
- C. Coordination: The Landscape Contractor shall coordinate, adjust, and relate together, work of this Section with other work of the Project and with work of other Contractors. Such coordination shall include but not be limited to:
1. Location of all underground utility lines and structures
  2. Scheduling of maintenance operations
- D. Verify that all work requiring access through or adjacent to areas where soil mixes are to be placed has been completed and no further access (other than Landscape installation) will be required. In the event that access will be required, this must be coordinated with the Engineer.

### 3.02 WEATHER LIMITATIONS

- A. Perform both blending and site soil work only during suitable weather conditions. Do not handle, haul, place, work, disc or rototill soil when frozen, excessively wet, or in otherwise unsatisfactory condition.

### 3.03 PREPARATION OF SOIL MIXES

- A. Uniformly blend all ingredients as required for each Soil Mix type, by wind rowing and/or tilling on a hard surfaced area.
1. The components of all soil mixes shall be blended so that ingredients are thoroughly incorporated into the mixture to assure uniform distribution.
  2. Do not over-mix; mix shall remain friable and well aerated.
  3. Organic matter shall be maintained moist, not wet, during blending.
  4. Delay mixing of fertilizers if planting will not follow within a few days.

### 3.04 PREPARATION OF SUB-GRADE

- A. Verify as-constructed or existing sub-grade elevation and perform additional grading operations as necessary to bring the sub-grade to a true, smooth, slope parallel to the finished grade, at all areas to receive soil mixes.
- B. Any sub-grades or soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render material unsuitable for plant growth, shall be removed from the premises whether or not such pollution occurred or existed prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes shall be reviewed and approved by the Engineer.
- C. Clean sub-grade and dispose of all debris prior to placement of soil mixes.
  - 1. Remove all large clods, lumps, brush, roots, stumps, litter, trash, and other foreign material and stones one-half inch in diameter or larger.
  - 2. Dispose of removed material legally off-site.
- D. Spray all vegetation on sub-grade with a pre-emergent weed killer at the rate of application recommended by the manufacturer.
- E. Protect adjacent pavements, walls, utilities and other construction from damage or staining by any soil mix placement operations.

### 3.05 STRUCTURAL SOIL MIX

- A. Do not place Structural Soil Mix until all walls, footings, curbs, utility work, or other construction is completed.
  - 1. Protect adjacent pavements, walls, utilities and other construction from damage or staining by soil mix.
- B. Excessive moisture is detrimental to the Structural Soil Mix.
  - 1. Verify moisture content prior to compaction, and provide drainage or dewatering as required.
  - 2. Allow 24 hours to drain if moisture content is excessive.
  - 3. Do not allow excess water to enter the mix before compaction.



**C. Compaction**

1. Prior to placing Structural Soil Mix, compact the sub-grade to not less than 95% Modified Proctor.
2. Place and spread Structural Soil Mix over the approved sub-grade, in 6-inch lifts. Compact each lift to not less than 95% Modified Proctor.
3. Provide compaction testing to conform compliance to specified compaction densities.
4. After completion of compaction operations, protect the installation from contamination by toxic materials or trash, and from water containing cement, clay, silt or any other materials which may alter the particle size distribution of the mix.

- D. Immediately following installation of Structural Soil Mix, install pavement base material or other materials as shown on the drawings to cover the Mix. Structural Soil Mix shall not be left uncovered by pavement for more than 4 days.

**3.06 GRADING OF SOIL MIXES**

- A. After settlement has occurred, add soil to maintain finished grades. If for any reason soil is left exposed for a long duration prior to planting, add soil and regrade as required.
- B. Protect placed Soil Mixes against construction activity with snow fencing or by other acceptable methods.
1. Protect from the eroding effects of wind and rain with filter fabric, as necessary.

**3.07 CLEAN UP**

- A. At the end of each work day the Contractor shall broom-clean the site, to remove all trash, debris, and loose soil materials.
- B. Immediately following the completion of soil mix installation operations, the Contractor shall remove all excess materials, stock piles, waste material, tools and equipment, and leave the site in a clear and clean condition.
- C. All waste materials shall become the property of the Contractor, who shall legally dispose of same off-site.

-END OF SECTION-

**Section 03100**  
**CONCRETE FORMS AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to design, furnish materials for, fabricate, erect, and remove formwork, falsework and shoring for cast-in-place concrete complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- C. In addition to the basic elements of formwork, the work specified in this Section includes the furnishing and installation of joints, sleeves, openings and embedded items into formwork as specified herein.
- D. This Section includes, but is not limited to, the following items:
  - 1. Lumber Forms
  - 2. Plywood Forms
  - 3. Steel Forms
  - 4. Precast Concrete Forms
  - 5. Form Ties
  - 6. Chamfer Strips
  - 7. Inserts
  - 8. Dovetail Anchor Slots
  - 9. Form-Facing Material
  - 10. Form Caulking
  - 11. Form Release Agent
  - 12. Shop Fabricated Forms
  - 13. Void Forms (Expanded Polystyrene Blocks)
  - 14. Form Liners
  - 15. Rustications
  - 16. Patching Material for Form-Tie Holes

**1.02 RELATED SPECIFICATIONS**

- A. Section 03200 - Concrete Reinforcement
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 03350 - Concrete Finishes
- D. Section 04201 - Unit Masonry

## 1.03 REFERENCES

A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Concrete Institute (ACI)
  - a. ACI 301, Specifications for Structural Concrete
  - b. ACI 303.1, Standard Specification for Cast-in-Place Architectural Concrete
  - c. ACI 347R, Guide to Formwork for Concrete
  - d. ACI SP-4, Formwork for Concrete
2. American Plywood Association (APA)
  - a. APA Grade – Trademarks
3. American Society for Testing and Materials (ASTM)
  - a. ASTM A36/A36M, Carbon Structural Steel
  - b. ASTM A572, High-Strength, Low Alloy Columbium-Vanadium Structural Steel
  - c. ASTM A992, Steel for Structural Shapes for Use in Building Framing
  - d. ASTM C39, Compressive Strength of Cylindrical Concrete Cylinders
  - e. ASTM D6817, Rigid, Cellular Polystyrene Geofoam
4. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals (BS&A) latest edition and amendments or supplements thereto
5. U.S. Department of Commerce Product Standards
  - a. PS 1-95 for Construction and Industrial Plywood

## 6. Western Wood Products Association (WWPA)

## a. WWPA Catalog "A" Product Use Manual

## 1.04 PERFORMANCE REQUIREMENTS

- A. Assume sole responsibility for the engineering, design, fabrication and installation of concrete formwork. Design formwork to produce concrete members identical in shape, lines and dimensions to members shown on the Contract Drawings.
- B. Design of formwork including layout, spans, fastenings, joints, framed openings, and shoring and reshoring systems shall be performed under the direct supervision of a licensed Professional Engineer currently registered in the State of New York, retained by the Contractor and experienced in structural design of formwork, falsework and shoring for cast-in-place concrete.
- C. Design and construct formwork in accordance with the provisions of ACI SP-4, ACI 303.1 and ACI 347R.
- D. Design formwork to resist the loads and lateral pressures prescribed in ACI 347R and wind loads as specified by the New York City Building Code, Local Law 76/2008.
- E. Design formwork bulkheads at construction joints to accommodate protrusion of reinforcing steel dowels as detailed on approved Shop or Working Drawings prepared in conjunction with Section 03200 - Concrete Reinforcement.
- F. Formwork surface materials: Use form surface material that will produce surfaces conforming to the following and as required to obtain the indicated finishes:
  - 1. Concrete exposed to view: Use material that will produce smooth, uniform, blemish-free concrete surfaces.
  - 2. Concrete concealed from view: Use material that will produce concrete surfaces free of fins and honeycombs.
- G. Void Forms: Adequacy of structural design of expanded polystyrene (EPS) blocks for use as void forms, including required density, compressive strength and dimensional stability, shall be certified by a licensed Professional Engineer currently registered in the State of New York.
- H. Special Sections: Provide construction joints, openings, offsets, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, waterstops, anchorages, inserts, and other features as required.
- I. Design formwork to be readily removable without impact, shock, or damage to uncured, green concrete surfaces and adjacent materials.

## 1.05 SUBMITTALS

- A. Prepare and submit the following in accordance with the provisions of the General Conditions and Section 01330 - Shop Drawings:
1. Certification by a licensed Professional Engineer currently registered in the State of New York that structural designs for all field-constructed and prefabricated formwork to be used on this project, including shoring and reshoring procedures for horizontal members, falsework and structural adequacy of void forms, were prepared in accordance with applicable codes, standards and publications of the American Concrete Institute and the New York City Building Code, Local Law 76/2008 as referenced herein. Submission of the Contractor's detailed Shop and Working Drawings of proposed formwork systems is not required and will not be reviewed for approval.
  2. Manufacturer's product data, compliance certification (as applicable) and installation instructions for the following:
    - a. Form ties
    - b. Inserts
    - c. Dovetail anchor slots
    - d. Form-facing material
    - e. Form caulking or gasketing
    - f. Form release agent
    - g. Void forms (expanded polystyrene blocks)
    - h. Form liners
    - i. Rustications
    - j. Patching material for form-tie holes.
  3. Form Removal Schedule: Submit proposed schedule for form removal indicating minimum length of time for form removal proposed for each type of element.
  4. Contractor's Surveyor: Submit qualifications of the Contractor's Surveyor to adequately survey all formwork and falsework locations, sleeves for conduits and pipework, openings and other embedments for future work.

## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Installer Qualifications: Demonstrate that proposed installer of void forms (expanded polystyrene blocks) has prior proven experience in the design, use and installation of void forms as a lightweight fill application and concrete formwork system.

- C. Assume responsibility for errors of detailing and fabrication and the correct fit of the formwork.
- D. Obtain submittal reviews before delivery of materials to the project site.
- E. Engage the services of a qualified and approved independent surveyor (Contractor's Surveyor) licensed in the State of New York in accordance with the provisions of the General Conditions for the performance of survey work specified herein.
- F. Form Liners: A representative of the manufacturer shall be present at the site to supervise the initial installation of each type of form liner and on an as-requested basis throughout the entire project.
- G. Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.
- H. Allowable Tolerances
  - 1. Set and maintain concrete forms within tolerance limits stated in ACI 347R. Provide more restrictive tolerances where required to meet project conditions.
  - 2. Formwork at exposed surface conditions, including slabs, beams, and walls shall not deviate more than 1/2" from theoretical design locations. Pile caps and grade beams shall not deviate more than 1" from theoretical design locations.
  - 3. Tolerances shall not be cumulative.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Store form panels at least two inches above ground and maintain form panels in a well ventilated and dry location, protected against damage, exposure to weather and contamination that can affect concrete. Support forms to protect against warpage.
- B. Lift form panels by means that will protect them against damage and destruction. Support panels using strongbacks while lifting panels in a horizontal position.
- C. Deliver manufactured products in manufacturer's original packaging with identification marks intact.

#### 1.08 PROJECT CONDITIONS

- A. After stake layout of on-site conditions, verify locations of on-site elements with the Commissioner and revise layout of formwork drawings as necessary to reflect adjustments and actual conditions.

- B. Protect formwork materials before, during and after erection to ensure acceptable finished concrete work. Protect in-place materials and other operations of work in connection with concrete placements.
- C. In the event of damage to erected forms, make necessary repairs or replacements prior to concrete placements at no expense to the City of New York.
- D. Allow sufficient times, as determined by the Commissioner from the approved schedule, between erection of forms and placing of concrete for the various trades to properly install their work.
- E. Do not apply external or superimposed loads, lateral or vertical, until concrete has developed the specified 28-day compressive strength and a minimum age of 14 days.
- F. Stay-in-place forms, except void forms where indicated, are not permitted without the Commissioner's prior approval.

## PART 2 PRODUCTS

### 2.01 FORM MATERIALS

#### A. Lumber Forms

- 1. Use only stress-grade lumber. Form framing, sheathing and shoring shall conform to WWP A Catalog A Product Use Manual.
- 2. For lumber in contact with concrete, use lumber dressed on at least the side contacting the concrete with dressed, tongue-and-groove or squared edges. Lumber shall be free of raised grain, knotholes, or other surface defects.
- 3. Other lumber may be dressed or rough.
- 4. Do not use lumber formwork where a smooth form finish is required; use plywood or steel forms.

#### B. Plywood Forms

- 1. Use only grade-marked plywood.
- 2. Use as a minimum B-B Plyform, Exterior Class 1 or 2, or HDO High Density concrete form plywood, Class 1 or 2 conforming to U.S. Product Standard PS 1.
- 3. Use thickness as required to maintain alignment and surface smoothness, but not less than 3/4-inch thick.

**C. Steel for Steel Forms**

1. Sheet: Use commercial grade not less than 16 gauge.
2. Structural shapes: Use structural shapes that conform to ASTM A36/A36M, ASTM A992 or ASTM A572 Grade 50.
3. Maintain steel forms in rust-free condition by use of steel wool and light grinding, followed by coats of approved form release agent.

**D. Steel Forms**

1. Use stock material for steel form surfaces that is free from warps, dents, bends, kinks, cracks, sags, and other irregularities. Thoroughly remove rust, oils and other foreign matter that could stain the concrete.
2. Fabricate panels in conformance with the Contractor's Shop or Working Drawings.
3. Reinforce outward facing surfaces as required to prevent warpage and deformation during concrete placement.

**E. Precast Concrete Forms**

1. Use precast concrete forms for cast-in-place concrete in-fill where indicated on the Contract Drawings and as specified herein.
2. Use forms of appropriate dimensions and adequate strength to withstand lateral pressures imposed by wet concrete.
3. Manufacture precast concrete forms in conformance with the Contractor's concrete mix design and Shop or Working Drawings.

**2.02 FORM ACCESSORIES****A. Form Ties**

1. Provide a cone-shaped, snap-in type form tie suitable for the intended use with a working load as required and an integral hot forged head.
2. Provide a form tie system that does not leave mild reinforcing steel after break-off or removal closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories shall not reduce the effective cover of the reinforcement.



3. Products: Subject to compliance with requirements, provide one of the following:
  - a. A-2 Cone Snap-in Form Tie; Dayton Superior, Miamisburg, OH
  - b. Equivalent form tie manufactured by Williams Form Engineering Corp., Grand Rapids, MI
  - c. Equivalent form tie manufactured by Symons Corp., Des Plaines, IL.
  - d. Or approved equal.
- B. Chamfer Strips: Provide one-inch by one-inch triangular fillets for chamfered corners. Provide fillets either milled from clear, straight-grain pine, surfaced each side, or of the extruded vinyl type with or without nailing flange unless otherwise indicated on the Contract Drawings.
- C. Inserts: Provide galvanized cast steel or galvanized welded steel inserts, complete with anchors to concrete and fittings such as bolts, wedges and straps.
- D. Dovetail Anchor Slots
  1. Provide dovetail anchor slots manufactured from minimum 22 gauge, electro-galvanized steel; with removable felt or polyurethane filler; bent tab anchors; securable to concrete formwork; use where indicated on the Contract Drawings or as specified in Section 04201 – Unit Masonry.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dur-O-Wal, Inc., Folcroft, PA
    - b. Heckmann Building Products, Melrose Park, IL
    - c. BoMetals, Inc., Powder Springs, GA
    - d. Or approved equal
- E. Form-Facing Material
  1. Use structural plywood or other material that can absorb air trapped in pockets between the form and the concrete and surface paste produced by certain high water-cementitious materials ratio admixtures. Maximum form-facing material use is three times. Provide forms with a suitable form treatment to prevent bond of the concrete to the form.
  2. As an alternate to using an absorptive wood form contact face as a form liner, use "Zendrain" or an approved equal in strict accordance with the manufacturer's recommendations.

**F. Form Caulking**

1. Provide a one-component, gun-grade silicone sealant that is capable of producing flush, watertight and non-absorbent surfaces and joints. Use sealant that is compatible with the type of forming material and concrete ingredients used.
2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Series 1200 Construction Caulking; GE Silicones, Waterford, NY
  - b. Dow Corning 999-A; Dow Corning Co., Midland, MI
  - c. Preco Silicone Caulk; Preco Industries, Ltd., Plainview, NY
  - d. Or approved equal

**G. Form Release Agent**

1. Provide a VOC-compliant, commercial formulation, form-coating compound that will not bind with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. Product shall not cause surface dusting.
2. Products: Subject to compliance with requirements, provide one of the following:
  - (1) Aquaform; Tamms Industries, Mentor, OH
  - (2) Specco F-100; Specco Industries, Inc., Chicago, IL
  - (3) Debond Form Coating; L&M Construction Chemicals, Inc., Omaha, NE
  - (4) Eucoslip VOX; Euclid Chemical Co., Cleveland, OH
  - (5) Magic Kote; Symons Corporation, Des Plaines, IL
  - (6) Or approved equal

- H. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

**2.03 SHOP FABRICATED FORMS**

- A. Fabricate forms in accordance with the Contractor's Shop or Working Drawings.

- B. Maintain forms such that they remain clean, smooth, and free from imperfections, irregularities and warpage.
- C. Formwork Joints: Locate as indicated on the Contractor's Shop or Working Drawings. Note that horizontal construction joints in cast-in-place concrete shall be installed at locations shown on the Contract Drawings unless prior approval to deviate from those locations is obtained from the Commissioner.
- D. Arrange form panels in symmetrical patterns conforming to the general lines of the structure.
- E. Except when otherwise indicated, orient panels on vertical surfaces with the long dimension horizontal and with horizontal joints level and continuous.
- F. Precisely align form panels on each side of the panel joint by means of fasteners common to both panels, to result in a continuous, unbroken concrete plane surface.
- G. Use largest stock size practicable.
- H. Between form joints, line an area less than the stock size of the form liner material with a single piece of liner material.

#### 2.04 VOID FORMS

- A. Void Forms: Void forms are used in ground fill applications where a lightweight fill material is required to reduce stresses on underlying soils and serve as formwork for concrete placements. Provide void forms constructed of rigid, cellular, termite-resistant, moisture-resistant, lightweight expanded polystyrene (EPS) blocks where indicated on the Contract Drawings and as specified herein.
  - 1. Material Requirements: EPS blocks shall conform to the material requirements of ASTM D6817. All EPS blocks shall be treated by the manufacturer with a tested and proven termite treatment for below grade applications.
  - 2. Performance Requirements
    - a. Manufacture specified material to withstand applied construction loads and weight or lateral pressure of wet concrete prior to final set.
    - b. Material shall be unaffected by normally occurring weather at the time of installation and shall retain its physical properties under engineered conditions of use.
    - c. Adequacy of structural design, including density, compressive strength and dimensional stability, shall be certified by a licensed Professional Engineer registered in New York State.

3. Products: Subject to compliance with requirements, provide one of the following:

- a. Perform Guard EPS Geofoam; R-Control Building Systems, Burnsville, MN
- b. Block-fill: Insulfoam Co., The Dalles, OR
- c. EPS Geofoam; Branch River Plastics, Smithfield, RI
- d. Or approved equal

B. Void Form Accessories: Provide corrosion-resistant, galvanized steel, multi-barbed connector to restrain EPS blocks from lateral movement in layer over layer applications. Determine the number of attachments needed to adequately resist the applied loads.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. AFM GeoGripper Plates: AFM R-Control Building Systems, Burnsville, MN
- b. Equivalent galvanized plates engineered to secure EPS blocks in place
- c. Or approved equal

## 2.05 FORM LINERS

A. Provide special concrete forms or form liners constructed of plastic, wood or sheet metal in accordance with the provisions of Section 03350 - Concrete Finishes and as indicated on the Contract Drawings. Form liners shall produce desired concrete finish with exposed patterns, surface textures, score joints or rustications in the configuration shown.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Dura-Tex; Symons Corporation, Des Plaines, IL
2. Architectural Form Liners; Greenstreak, Inc., St. Louis, MO
3. Or approved equal

## 2.06 RUSTICATIONS

A. Provide rustications where specified herein or as indicated on the Contract Drawings.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Rustications; Symons Corporation, Des Plaines, IL
2. PVC Rustications; Victory Bear, Huber Heights, OH
3. Or approved equal

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Examine the areas and conditions under which work of this Section is to be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Prior to placement of concrete, inspect forms for cleanliness, accuracy of alignment, strength and required inserts and openings.
- B. Earth cuts are not permitted for use as forms for vertical surfaces against which concrete will be cast, including electrical ductbanks, unless shown on the Contract Drawings or specified herein.
- C. Verify that substrate, grade and other conditions which have been prepared under other Sections are acceptable for installation of void forms (EPS blocks) in accordance with manufacturer's instructions. Report in writing adverse conditions that are detrimental to the installation of void forms. Do not proceed until adverse conditions are corrected.
- D. Where different levels are indicated for wall footings, the footings shall be stepped. Unless otherwise indicated on the Contract Drawings, steps in wall footings shall not be of greater height than the thickness of the footings, and steps shall not lap less than 6 inches. No form shall be set at the back of such steps and where earth has slumped off in such locations, it shall be cut back to a vertical plane just before the concrete is placed.

### 3.02 ERECTION AND INSTALLATION

- A. Construct forms in accordance with the provisions of ACI 301 and ACI 347R to required dimensions, plumb and straight, true to line and grade, and make all joints and seams mortar-tight. Forms submerged in water shall be made watertight. Formwork shall be gasketed or otherwise rendered sufficiently tight to prevent leakage of paste or grout under heavy, high-frequency vibration. Securely brace and shore forms to prevent displacement and to safely support imposed concrete weight.
- B. Erect beam and girder soffits in accordance with the provisions of ACI 347R and to the standard tolerances delineated therein. Soffits shall be sufficiently braced, shored, and wedged to prevent deflection. Column sides shall be clamped in

accordance with this specification with metal column clamps, spaced according to the manufacturer's directions.

- C. Chamfer above grade exposed joints, edges and external corners of concrete forms with a one inch by one inch triangular fillet unless otherwise indicated.
- D. Furnish forms for repeated use in sufficient number to ensure the required rate of progress. Clean forms and inspect immediately prior to depositing concrete. Remove deformed, broken or defective forms from the work site.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout and removal of debris, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms in as inconspicuous a location as possible consistent with the requirements of the work.
- F. Provide openings in concrete formwork of the correct size and in the proper location to accommodate other operations of construction work in the project. Accurately place and securely support items to be built into forms. Install waterstops where shown on the Contract Drawings and as specified in Section 03300 - Cast-in-Place Concrete.
- G. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface.
- H. Provide required finish on formed concrete surfaces for normal cast-in-place concrete in accordance with the provisions of Section 03350 - Concrete Finishes and as indicated on the Contract Drawings.
- I. Provide required finish on formed concrete surfaces for cast-in-place architectural concrete in accordance with the provisions of ACI 303.1 and as specified.
- J. Wet forms sufficiently to prevent joints in wood forms from opening prior to concrete placement.
- K. Cutting form ties back from the face of the concrete is prohibited.
- L. Roughen and clean interior contact surfaces of precast concrete forms prior to placing cast-in-place concrete in-fill. Apply approved epoxy bonding agent to dry, clean interior contact surfaces as specified in Section 03300 - Cast-in-Place Concrete and in strict accordance with manufacturer's printed instructions.
- M. Void Forms: Install void forms (EPS blocks) and related products in strict accordance with the manufacturer's instructions. Conform to the dimensions indicated on the Contract Drawings to completely fill the void underlying and adjacent to the formed surfaces of the concrete placement.

## N. Form Liners and Rustications

1. Install form liners and reveal rustication strips in strict accordance with the respective manufacturer's written instructions and recommendations. The ends of the form liner pattern shall be plugged and all form joints and edges shall be taped using 1/8-inch thick by 3/4-inch wide foam tape centered on the joints, then caulked in accordance with the manufacturer's recommendations each time forms are set. A representative of the manufacturer shall be present at the site to supervise the installation of the form liner for the initial installation of each type of form liner and on an as-requested basis throughout the entire project.
2. Forms for smooth concrete shall be installed in such a manner that there will be no horizontal form joints, and the forms shall be aligned so that vertical joints occur only at "V-Groove" rustications. Form ties shall be spaced in a uniform pattern vertically and horizontally. Form ties shall be positioned in smooth concrete bands and in panels between "reveal" rustications, if any.

## O. Apply form release agents in accordance with manufacturer's instructions and as specified herein.

1. Coat form contact surfaces with approved form release agent compound before reinforcement is placed. Do not allow excess form release agent material to accumulate in the forms or to come into contact with surfaces which are required to be bonded to fresh concrete such as concrete reinforcement and embedded items.
2. Before concrete placement, coat the contact surfaces of forms with a non-staining mineral oil, non-staining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.
3. Coat steel forms with non-staining, rust-preventive form oil or otherwise protect against rusting. Do not use rust-stained steel surfaces for contact with concrete.
4. Do not allow form coatings to come in contact with construction joints or reinforcing steel.

## P. Observe formwork continuously while concrete is being placed to ensure that there are no deviations from desired elevation, alignment, plumbness and camber. If, during concrete placement, weakness develops and the formwork shows settlement, deflection or distortion, immediately stop the work, remove improperly cast concrete, and reconstruct the formwork to perform properly.

### 3.03 INSTALLATION TOLERANCES

- A. Allowable Tolerances: Set and maintain formwork within the tolerance limits delineated in ACI 347R.

### 3.04 PROTECTION

- A. During installation, do not use forms as a storage platform nor as a working platform until the forms have been permanently fastened in position.
- B. Do not overload the surface of installed forms.

### 3.05 RESHORING

- A. When reshoring is permitted or required, plan the operations in advance and in accordance with acceptable procedures. Prepare and submit for review and approval reshoring procedures under the direct supervision of the Contractor's licensed Professional Engineer registered in New York State.
- B. During reshoring, do not load the concrete in beams, slabs, columns, or any other structural members with combined dead and construction loads in excess of the loads permitted by the Commissioner for the developed concrete compressive strength at the time of reshoring.
- C. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped a minimum of two days after concrete placement if loads are not applied to the members.
- D. Install reshores after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.
- E. After forms are removed, reshore slabs and beams over 10 feet in span and cantilevers over 4 feet in length for the remainder of the specified time period in accordance with the Article specified herein entitled "Removal of Forms and Ties." Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending.
- F. Reshoring elements, as a minimum, shall have the same load-carrying capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.
- G. Perform reshoring for the purpose of early form removal so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no live loads shall be permitted on the new construction. Tighten reshores to carry their required loads, but do not over-tighten such that the



new construction is overstressed. Maintain reshores in place until the concrete has reached its specified 28-day compressive strength, unless otherwise specified.

- H. For floors supporting shores under newly placed concrete, the original supporting shores or reshores shall be left in place. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated dead and live loads and, in all cases, shall have a capacity equal to at least one-half of the capacity of the shoring system above. Reshores shall be located directly under the floors supporting shores unless other locations are permitted by the Commissioner or shown on the Contract Drawings.
- I. For multi-story buildings, extend reshoring over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads so that the design superimposed loads of the floors supporting shores are not exceeded.

### 3.06 REMOVAL OF FORMS AND TIES

- A. Remove forms and supports in accordance with ACI 347R recommendations without damage to concrete and in a manner to insure complete safety to the structure and the public. Forms, form ties and bracing shall not be removed without specific permission of the Contractor's licensed Professional Engineer registered in New York State.
- B. In general, do not remove forms until the concrete has hardened sufficiently to safely support its own load, plus any superimposed load that might be placed thereon. Forms shall remain in place for the minimum time periods specified in ACI 347R, except that forms may be removed earlier than specified if ASTM C39 test results of field-cured samples from a representative portion of the structure or other approved and calibrated non-destructive testing techniques show that the concrete has reached a minimum of 85 percent of the specified design strength.
- C. For concrete placed underwater, forms shall remain in place a minimum of 48 hours.
- D. Remove top forms on sloping surfaces of concrete as soon as removal operations will not allow the concrete to sag. Perform needed repairs or treatment required on sloping surfaces at once followed immediately with the specified curing.
- E. Whenever formwork is removed during the specified curing period, continue curing the exposed concrete surfaces in accordance with one of the methods specified in Section 03300 - Cast-in-Place Concrete.
- F. Upon removal of forms, notify the Commissioner in order that a review of the newly stripped surfaces may be made before patching.
- G. Loosen wood forms for wall openings without causing damage to the concrete. Avoid prying against the face of finished concrete. Use only wooden wedges.

- H. Take care in removing forms, wales, supports and form ties to avoid spalling or marring the concrete. Initiate rubbed finish, if required, and such patching as may be necessary immediately after removal.
- I. Patch form tie holes with an approved non-shrink patching material in accordance with the manufacturer's recommendations and subject to approval.
- J. Hammer-pack holes left by tie rods with stiff mortar of the same material as, but somewhat leaner than that in the concrete. Render the patch inconspicuous to view. Complete patching within 24 hours of form removal.

### 3.07 RE-USE OF FORMS

- A. Forms for re-use shall meet new form requirements with respect to effect on cast-in-place concrete appearance and structural stability.
- B. Limit reuse of plywood to no more than three times. Re-use may be further limited by the Commissioner if it is found that the pores of the plywood are clogged with paste to the degree that the wood does not absorb the air or surface paste produced by certain high water-cementitious materials ratio admixtures.
- C. Re-use of forms shall in no way delay or change the concrete placement schedule as compared to the schedule obtainable if all forms were new (in the case of wood forms) or if the total required forms were available (in the case of steel forms).
- D. Clean and re-oil formwork prior to re-use. Plywood forms may not be re-used if unused holes from form ties exist from a previous use.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 03200**  
**CONCRETE REINFORCEMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install epoxy-coated and uncoated reinforcement for cast-in-place concrete and precast structural concrete, including reinforcing bars, welded wire reinforcement and accessories, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- C. Provide concrete reinforcement for all cast-in-place and precast concrete structures and elements specified in Sections 03300 and 03410 as follows unless indicated otherwise on the Contract Drawings or in the Specifications:
  - 1. Epoxy Coated Reinforcement
    - a. Reinforced cast-in-place concrete elements of the transfer station, including supporting substructure, beyond the footprint of the enclosed superstructure (south of column line H and east of column line 17)
    - b. Reinforced concrete elements of the exterior ramp structures including the supporting substructure and abutments
    - c. Weigh scale supporting structure
    - d. Concrete approach slabs
    - e. Concrete apron slabs
    - f. Transformer Enclosure
  - 2. Uncoated Reinforcement:
    - a. Reinforced cast-in-place concrete elements of the transfer station including supporting substructure within the footprint of the enclosed superstructure (from column line A through H and 1 through 17)

- b. Structural precast concrete ventilation duct shafts within the transfer station
  - c. Reinforced concrete elements of land-based site structures
- D. This Section includes, but is not limited to, the following items:
  - 1. Reinforcing Steel Bars
  - 2. Welded Wire Reinforcement
  - 3. Steel Tie Wire
  - 4. Epoxy Coating
  - 5. Epoxy Repair Coating
  - 6. Supports for Reinforcement
  - 7. Exothermic Welded Splices
  - 8. Dowel Adhesive System
- E. Concrete reinforcement and coating requirements for precast architectural concrete are specified under Section 03450 - Plant-Precast Architectural Concrete.

#### 1.02 RELATED SPECIFICATIONS

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 03410 - Precast Structural Concrete
- C. Section 03450 - Plant-Precast Architectural Concrete

#### 1.03 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Concrete Institute (ACI)
    - a. ACI 301, Standard Specifications for Structural Concrete.
    - b. ACI 315, Manual for Standard Practice for Detailing Reinforced Concrete Structures
    - c. ACI 318, Building Code Requirements for Reinforced Concrete
    - d. ACI SP66, Detailing Manual
  - 2. American National Standards Institute/American Welding Society (ANSI/AWS)
    - a. ANSI/AWS, D1.4, Structural Welding Code - Reinforcing Steel

3. American Society for Testing and Materials (ASTM)
  - a. ASTM A82, Steel Wire, Plain, for Concrete Reinforcement
  - b. ASTM A185, Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
  - c. ASTM A496, Steel Wire, Deformed, for Concrete Reinforcement
  - d. ASTM A497, Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
  - e. ASTM A615/A615M, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - f. ASTM A775/A775M, Epoxy-Coated Reinforcing Steel Bars
  - g. ASTM D3963/D3963M, Fabrication and Jobsite handling of Epoxy-Coated Reinforcing Steel Bars
4. Concrete Reinforcing Steel Institute (CRSI), DA4, Manual of Standard Practice
5. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto
6. Society for Protective Coatings (SSPC), formerly Steel Structures Painting Council, Steel Structures Painting Manual
  - a. SSPC-SP-10/NACE No. 2, Near-White Blast Cleaning

#### 1.04 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  1. Shop Drawings
    - a. Detailed placing and shop fabrication drawings, for fabrications, bending and placement of concrete reinforcement prepared in conformance with ACI 315.

- b. Shop Drawings shall show bar schedules, stirrup spacing, diagrams of bent bar arrangements and assemblies, arrangement of concrete reinforcement, location and length of lap splices, special reinforcement required at openings through concrete structures or at embedments, supports, accessories, and concrete cover to the extent necessary for proper fabrication and placement of concrete reinforcement.
    - c. Shop Drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, spacing and splicing of reinforcement.
  - 2. Manufacturer's specifications and installation instructions for all proprietary materials and reinforcement accessories.
  - 3. Material specifications and mill test certification reports for reinforcing steel and welded wire reinforcement, showing physical and chemical analyses.
  - 4. Description of proposed supports for each type and location of reinforcement.
  - 5. Evidence that the epoxy-coating applicator is certified by CRSI.
  - 6. Description of reinforcing weld locations and weld procedures.
  - 7. Certification from an independent testing laboratory that mechanical connectors for reinforcing steel comply with specified requirements.
  - 8. Welders Certificates: Certify welders employed in the work, verifying ANSI/AWS qualification within the previous 12 months.
- B. Shop Drawings shall also indicate the following requests, as applicable:
- 1. Request to relocate any bars that cause interferences or that cause placement tolerances to be violated.
  - 2. Request to use splices not shown on the Contract Drawings.
  - 3. Request to use mechanical couplers accompanied by manufacturer's literature, installation instructions and certified load capacity test reports.
  - 4. Request for placement of column dowels without the use of templates.
  - 5. Request and procedure to field bend or straighten partially embedded reinforcing bars.
- C. Base Shop Drawings upon field-verified dimensions and elevations of existing or partially constructed structure, where applicable, to allow proper review of Shop Drawings.

- D. Prepare reinforcement placing drawings to provide a complete dimensioned representation of the arrangement of reinforcement to allow placement without reference to the Contract Drawings, including location of reinforcing steel, support bars, chairs and bolsters, locations of construction, expansion and control joints, and sequence of concrete placements.
- E. Prepare complete elevations of all walls and complete plans of all slabs, except where two or more walls or slabs are identical, and identify diameter and spacing of wall and slab reinforcing steel on such views. Prepare sections to clarify the arrangement of the steel reinforcement, and identify by diameter but not spacing of wall and slab reinforcement in such sections. For all reinforcing bars, unless the location of the bar is clear, provide a dimension from the bar or bars to a readily distinguishable structural feature on the drawing to facilitate placement.
- F. Check Shop Drawings for completeness and accuracy and make necessary corrections prior to submittal for review and approval. Obtain Commissioner's approval prior to fabrication.
- G. Review of Shop Drawings will be for general considerations and design intent only. Compliance with specified requirements for materials, fabrication and placement of concrete reinforcement shall be the Contractor's responsibility.

#### 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the New York City Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Testing and Inspection
  - 1. Fabrication, placement and welding of reinforcing steel shall be subject to special inspection in the mill, shop and field in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
  - 2. Special Inspections
    - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special



Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.

- b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
- c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

C. Allowable Tolerances

- 1. Fabrication: Deviations from indicated dimensions (plus or minus) in excess of the following will not be permitted.
  - a. Sheared length: 1 inch
  - b. Height of truss bars: 2 inch
  - c. Stirrups, ties, and spirals: 1/2 inch
  - d. Bent length: 1 inch
- 2. Placement: Conform to the requirements specified in ACI 318 and comply with CRSI recommended practice as specified herein.

D. The epoxy-coating applicator shall be certified by CRSI under the CRSI Fusion-Bonded Epoxy Coating Applicator Plant Certification Program.

E. Weld and Welder Qualifications: Perform welding of reinforcing steel using only welders qualified in accordance with ANSI/AWS D1.4. Perform welding procedure qualification, except for pre-qualified procedures, as required by ANSI/AWS D1.4, prior to executing welding of reinforcing steel.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Ship concrete reinforcement from source in bundles of one size and length, securely tied and identified with plastic tag showing specification number, grade, heat number, bundle number, and name and location of mill.

- B. Upon delivery to job site, store reinforcement in neat bundles, tagged for placement and properly identified for coordination with mill test reports.
- C. Identify each group of bent and straight bars with a metal tag providing the identifying member corresponding to the shop drawing and bar schedule.
- D. Store concrete reinforcement above ground surface and support as required to prevent formation of kinks, distortions, excessive rusting, contamination by oil, mud, and other materials that could destroy its usefulness. Protect reinforcement from exposure to weather at all times prior to placement by suitable covering. Protect reinforcement from conditions conducive to corrosion at all times until concrete is placed around it.
- E. Bulk delivery of reinforcement steel will not be permitted.
- F. Perform job site handling of epoxy-coated reinforcing steel bars in accordance with ASTM D3963/A3963M. Equipment for handling epoxy-coated reinforcing bars shall have protected contact areas. Lift bundles of epoxy-coated bars at multiple pickup points to prevent bar-to-bar abrasion from sags in the bundles. Dropping or dragging of epoxy-coated bars or bundles of epoxy-coated bars is prohibited. Store epoxy-coated bars on protective cribbing.
- G. Thoroughly clean the surfaces of reinforcing steel and accessories to be in contact with concrete of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances just prior to concrete placement. Where there is a delay in concrete placement, re-inspect and re-clean reinforcement if necessary.

#### 1.07 PROJECT CONDITIONS

##### A. Field Measurements

- 1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
- 2. Take sufficient field measurements prior to preparation of Shop Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.
- 3. Actual field-verified conditions may require modifications to the construction details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 REINFORCEMENT MATERIALS

- A. Carbon Steel Reinforcing Steel Bars, Uncoated: Provide deformed billet steel reinforcing bars, conforming to ASTM A615/A615M, Grade 60 where noted in the Specifications or shown on the Contract Drawings..
- B. Carbon Steel Reinforcing Steel Bars, Epoxy-coated: Provide epoxy-coated deformed billet steel reinforcing bars, conforming to ASTM A615/A615M, Grade 60, and to ASTM A775/A775M where noted in the Specifications or shown on the Contract Drawings..
  - 1. Coating Color: Light color shades that will reveal rusted or undercoated areas of steel.
- C. Welded Wire Reinforcement, Uncoated: Provide plain welded wire reinforcement in flat sheets conforming to ASTM A185 for plain wire or ASTM A497 for deformed wire.
- D. Steel Wire, Uncoated or Epoxy Coated: ASTM A82, plain, cold drawn steel or ASTM A496, deformed, size D4 and larger. Use epoxy coating steel wire in conjunction with epoxy-coated reinforcing steel. Use for securing reinforcing bars and embedded items.

### 2.02 SUPPORTS FOR REINFORCEMENT

- A. Wire Bar Supports: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place. Use Class 1 (plastic protected) wire bar type supports complying with maximum protection recommendations of CRSI Manual of Standard Practice DA4 for formed surfaces exposed to weather or to view. Use Class 2, moderate protection, wire bar supports for all other conditions.
  - 1. For slabs placed on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. The use of concrete bricks, or other similar supports, is prohibited.
- B. Supports for Epoxy-Coated Reinforcement: Use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

### 2.03 WELDING

- A. When required or permitted, all welding of reinforcing bars shall conform to ANSI/AWS D1.4. Unless otherwise specifically permitted by the Commissioner, welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.

- B. Welding of wire to wire, and of wire or welded wire reinforcement to reinforcing bars or structural steels, shall conform to applicable provisions of ANSI/AWS D1.4 and any supplementary requirements specified by the Commissioner for the particular application.
- C. After completion of welding on epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with the requirements described herein. All welds and all steel splice members when used to splice bars shall be coated with the same material used for repair of coating damage.

#### 2.04 EXOTHERMIC WELDED SPLICES

- A. Where applicable, use a welded butt splice system in conformance with ACI 301 that develops a minimum of 125 percent of the specified yield strength of the reinforcing bar in tension and compression via an exothermic load transfer between the bar deformations and an internally grooved sleeve. Coat connectors in accordance with same requirements as reinforcing bars.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Cadweld: Erico, Inc., Cleveland, OH
  - 2. Thermweld Process: Continental Industries, Tulsa, OK
  - 3. Or approved equal

#### 2.05 DOWEL ADHESIVE SYSTEM

- A. Where shown on the Contract Drawings or otherwise approved by the Commissioner on a case-by-case basis, use a two-component dowel adhesive system to anchor reinforcing bars into hardened concrete.
- B. Inject adhesive mix with a static mixing nozzle in accordance with manufacturer's printed instructions.
- C. Provide embedment depth in accordance with manufacturer's recommendations to provide minimum allowable bond strength equal to 125 percent of the yield strength of the bar, unless noted otherwise on the Contract Drawings.
- D. Obtain Commissioner's approval for use of a dowel adhesive system at locations other than those indicated on the Contract Drawings.
- E. Products: Subject to compliance with requirements, provide one of the following:
  - 1. HIT HY-150 Injection Adhesive Anchor System: Hilti, Inc., Tulsa, OK
  - 2. Epcon System: ITW Ramset/Redhead, Glendale Heights, IL
  - 3. Sikadur Injection Gel: Sika Corporation, Lyndhurst, NJ
  - 4. Or approved equal

## 2.06 EPOXY REPAIR COATING

- A. Provide a field-applied, VOC-compliant, epoxy-based corrosive-resistant coating either identical to or compatible with shop-applied epoxy coatings.
- B. Coatings which are not identical to those shop applied shall meet or exceed the minimum performance of the shop-applied materials.

## PART 3 EXECUTION

### 3.01 FABRICATION

- A. General: Conform to the accepted Shop Drawings.
- B. Cutting and Bending: Conform to requirements of ACI 318 and ACI 315. Perform cutting and bending of reinforcing bars in shop before shipment to the site and before epoxy coating unless written approval for field bending is obtained from the Commissioner or is required by local labor jurisdiction. Bend all bars cold unless permitted by the Commissioner in writing. Do not bend or straighten bars in a manner that could damage the materials.
- C. Fabricate reinforcing bars in accordance with the standard fabricating tolerances in Figures 4 and 5 of ACI 315. Tolerances shall not permit a reduction in concrete cover.
- D. Epoxy Coating: Prepare concrete reinforcement to be epoxy coated by abrasive blast cleaning to near-white metal in accordance with SSPC-SP-10. Apply coating by electrostatic spray method as soon thereafter as possible in accordance with the recommendations of the coating material manufacturer.

### 3.02 EXAMINATION

- A. Verify that surface over which concrete is to be placed is clean and in proper condition for installing reinforcement.
- B. Verify that items to be embedded and blockouts are secured in place as required.
- C. Verify that formwork supports are complete, secure and in place.

### 3.03 INSTALLATION

- A. General: Comply with provisions of ACI 301 and as herein specified.
- B. Clean reinforcement, as required, to remove loose rust, mill scale, earth, ice, grease, oil, clay or foreign substances that could reduce bond of reinforcement with concrete.

- C. Arrange and place reinforcement as indicated on the accepted bending diagrams and placement plans.
- D. Positively secure reinforcement and welded wire fabric against displacement during placement of concrete. Wire or clip bars together in accordance with ACI recommendations. Tack welding of reinforcement is not permitted.
- E. With formwork for as-cast finish, use spacers which will not be visible at exposed finish and which will be sheathed in nylon to the depth of minimum cover as required.
- F. Concrete Cover
  - 1. Accurately position reinforcement, including stirrups, to achieve a clear coverage for concrete protection, measured from outside of bar or welded wire reinforcement to surface of concrete, as detailed on the approved Shop Drawings or as directed by the Commissioner.
  - 2. Minimum concrete cover for reinforcement is shown below unless otherwise indicated on the Contract Drawings. Placement tolerance is plus 1/4 inch. Cover to principal reinforcement shall be not less than two times the nominal maximum aggregate size nor less than 1.5 times the effective diameter of the reinforcing bars.

<u>Minimum Concrete Cover for Reinforcement</u>	
<u>Description</u>	<u>Minimum Cover (inches)</u>
1. Concrete cast against and permanently exposed to earth	3
2. Concrete exposed to earth, liquids or weather: <ul style="list-style-type: none"> <li>a. Principal reinforcement</li> <li>b. Stirrups, ties and spirals</li> </ul>	2 1-1/2
3. Concrete not exposed to liquids or weather or in contact with earth: <ul style="list-style-type: none"> <li>a. Principal reinforcement</li> <li>b. Stirrups, ties and spirals</li> </ul>	1-1/2 1
4. Structural concrete floor and ramp slabs: <ul style="list-style-type: none"> <li>a. Top reinforcement</li> <li>b. Bottom reinforcement</li> </ul>	2 1-1/2
5. Concrete topping slab and composite steel deck (welded wire reinforcement)	1

<u>Minimum Concrete Cover for Reinforcement</u>	
<u>Description</u>	<u>Minimum Cover (inches)</u>
6. Footings and base slabs:	
a. At formed sides and ends and at bottoms bearing on concrete work mat	2
b. At unformed surfaces and bottoms in contact with earth	3
c. Top of footings	2
d. Over top of piles	2

- G. Do not place reinforcement continuous through expansion joints. Reinforcement shall be continuous through construction and control joints.
- H. Reinforcement or other embedded metal items bonded to the concrete shall not be continuous through any joint intended as an expansion joint. Dowels bonded on only one side of a joint and waterstops may extend through the joint.
- I. Place and secure reinforcement bars and welded wire reinforcement in position by means of accepted non-corrosive spacers, supports, chairs, runners, standees, bolsters or hangers as required.
- J. Do not field bend reinforcing bars partially embedded in concrete without the Commissioner's written approval.
- K. Welding: Welding of reinforcing steel is not permitted, unless approved by the Commissioner in advance for each specific application. Perform welds in accordance with ANSI/AWS D1.4.
- L. Moving bars to avoid interference with other reinforcement, conduits or embedded items exceeding the specified tolerances is subject to prior written approval of the Commissioner.
- M. Repair of Epoxy Coating
1. Repair damage to epoxy coating either as described in ASTM D3963/D3963M or by mechanical wire brush cleaning and painting with an approved epoxy repair coating in accordance with the coating manufacturer's written instructions.
  2. Repair any reinforcement with visible signs of rust.
  3. Repair of damaged epoxy coating of more than five percent of the total reinforcement surface area will not be allowed; replace such reinforcement at no additional cost to the City of New York.

4. Fading of the epoxy coating color will not be cause for rejection of epoxy-coated reinforcement.
  - N. Exposed Reinforcement: Reinforcement left exposed for the bonding of future construction shall be effectively protected from corrosion by encasement in cement mortar or lean concrete or by other temporary covering approved by the Commissioner.
  - O. Field Cutting of Reinforcement: Reinforcement shall not be cut in the field except when specifically permitted in writing by the Commissioner.
- 3.04 SUPPORTS AND SPACERS FOR REINFORCEMENT AND WELDED WIRE REINFORCEMENT
- A. Support reinforcing bars and welded wire reinforcement in position by means of accepted spacers, chairs or hangers.
  - B. Install sufficient number of supports and of strength to withstand deflection of reinforcement from indicated cross-sectional position. Do not place reinforcing bars more than two inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
  - C. Do not use stones, brick, wood blocks or pieces of broken concrete to support reinforcing steel.
  - D. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy coated. In walls having epoxy-coated reinforcing bars, spreader bars, where specified, shall be epoxy coated. Proprietary combination bar clips and spreaders used in wall with epoxy-coated reinforcing bars shall be made of corrosion-resistant material or coated with dielectric material.

3.05 SPLICING

- A. Locate splices as indicated on the approved Shop Drawings or as directed by the Commissioner. When it is necessary to splice reinforcing at points other than where shown, the character of the splice shall require approval by the Commissioner.
- B. Provide splices in accordance with the required lengths given on the Contract Drawings and in conformance with ACI 318 and ACI 315. Do not splice at points of maximum stress.



- C. Mechanical couplers and exothermic welded splices shall be used only where shown on the Contract Drawings unless permitted otherwise in writing by the Commissioner. Prepare ends of bars to be exothermically welded, insert ends into high strength welding sleeve and follow welding procedures in strict accordance with printed instructions of the exothermic welding system manufacturer.
- D. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Contract Drawings. Seal couplers during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

### 3.06 WELDED WIRE REINFORCEMENT PLACEMENT

- A. Install in as long lengths as practicable. Lap adjoining pieces at least one full mesh size and attach splices with No. 14 gauge tie wire, one tie for each running foot. Wires shall be staggered and tied in such a manner that they cannot slip. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- B. Welded wire reinforcement for slabs on grade shall extend to within 2 inches of the concrete edge. Welded wire reinforcement shall extend through construction and contraction joints unless otherwise shown on the Contract Drawings.
- C. Adequately support welded wire reinforcement to assure proper positioning in the slab. Secure and support all welded wire reinforcement in the final location prior to the placement of concrete. The use of rakes to pull welded wire reinforcement into place or pushing welded wire reinforcement into place is prohibited.

### 3.07 DOWEL ADHESIVE SYSTEM INSTALLATION

- A. Install dowels in hardened concrete using an approved dowel adhesive system in strict conformance with the manufacturer's recommendations. Support dowels in the correct position until the adhesive sets and gains enough strength to prevent any dislocation.
- B. Proof test at least 25 percent of the dowels to be installed to 1.33 times the allowable load specified by the manufacturer of the adhesive-injection system.
- C. If the dowels are required to have a hook at the end to be embedded in the new work, an approved mechanical coupler shall be provided at a convenient distance from the face of existing concrete to facilitate the testing.

## 3.08 FIELD QUALITY CONTROL

- A. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Do not install reinforcement or welded wire reinforcement without approved placement drawings on site. Prior to concrete placement, inspect the installed reinforcement and welded wire reinforcement for acceptable condition, compliance with approved Shop Drawings, adequate support against displacement, and proper concrete cover and location. Correct deficiencies prior to placing concrete. Concrete placed in violation of this provision may be rejected with subsequent removal by the Contractor at no cost to the City of New York.
- C. Unacceptable Materials: Do not use reinforcement with any of the following defects:
  - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
  - 2. Bends not indicated on the approved Shop Drawings.
  - 3. Kinks, gouges, excessive rust, deleterious materials, or other visible damage.
  - 4. Visible gaps or other defects in the surface of epoxy-coated bars.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 03300**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of providing all labor, materials, equipment, services and incidentals necessary to furnish and install normal weight and structural lightweight cast-in-place concrete complete in place as indicated on the Contract Drawings, as specified herein and as required for a complete installation in all respects.
- B. The work includes producing concrete consisting of specified constituents; development and control of concrete mix designs; storage and quality control of concrete ingredients; and batching, mixing, production quality control and delivering of concrete of specified compressive strength class, maximum size aggregate, and slump. The work also consists of placing, curing and protecting cast-in-place concrete, reinforced and non-reinforced as required. The work also includes providing openings in concrete; embedded items such as reinforcement, sleeves, frames, anchor bolts and inserts; and concrete equipment bases and support structures, all as required to facilitate work under this and other Sections.
- C. The work covered in this Section includes but is not necessarily limited to the following uses of cast-in-place concrete:
  - 1. Cast-in-place structural concrete for use in the transfer station building and pier deck, exterior access ramp structures and miscellaneous site structures, such as weigh scale supporting structures, retaining walls, transformer enclosures, equipment pads, utility supports, electrical duct banks, pipe encasements, manholes and vaults.
  - 2. Cast-in-place concrete toppings to be placed atop certain structural floor slabs in the transfer station building and bonded overlays on the traffic deck slab of exterior ramp structures.
  - 3. Structural lightweight concrete for use in the composite steel floor deck at the mezzanine level only.
  - 4. Concrete fill for use in steel pipe piles as specified in Section 02364 – Steel Pipe Piles.
- D. Cast-in-place concrete for uses specified elsewhere:
  - 1. Cast-in-place concrete for use in concrete paving, curbing, headers, sidewalks and appurtenant items is specified herein but uses are described in Section 02771 – Concrete Curbs, Headers and Sidewalks.

- E. Finishing of cast-in-place concrete surfaces shall conform to the requirements described in Section 03350 - Concrete Finishes.
- F. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- G. This Section includes, but is not limited to, the following items:
  - 1. Portland Cement
  - 2. Fly Ash or Pozzolan
  - 3. Ground Granulated Blast Furnace Slag
  - 4. Fine Aggregate
  - 5. Coarse Aggregate
  - 6. Water
  - 7. Concrete Admixtures
  - 8. Epoxy Bonding Agent
  - 9. Curing and Protection Materials
  - 10. Preformed Compressible Joint Filler
  - 11. Joint Sealant
  - 12. Joint Sealant Backer Rod
  - 13. Construction Joint Filler
  - 14. Epoxy Resin for Grouting Dowels
  - 15. Non-shrink Grout
  - 16. PVC Waterstops
  - 17. Hydrophilic Waterstop and Sealant
  - 18. Special Provisions for:
    - a. Exterior Cast-in-place Concrete Ramp Structures
    - b. Bonded Concrete Overlay for Exterior Ramp Structures

## 1.02 RELATED SPECIFICATIONS

- A. Section 02364 - Steel Pipe Piles
- B. Section 02771 - Concrete Curbs, Headers and Sidewalks
- C. Section 03100 - Concrete Forms and Accessories
- D. Section 03200 - Concrete Reinforcement
- E. Section 03350 - Concrete Finishes
- F. Section 05120 - Structural Steel

## 1.03 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Association of State Highway and Transportation Officials (AASHTO)
  - a. AASHTO M182, Burlap Cloth Made from Jute or Kenaf
2. American Concrete Institute (ACI)
  - a. ACI 117, Tolerances for Concrete Construction and Materials
  - b. ACI 121R, Quality Assurance Systems for Concrete Construction
  - c. ACI 201.2R, Durable Concrete
  - d. ACI 211.1, Selecting Proportions for Normal, Heavyweight, and Mass Concrete
  - e. ACI 211.2, Selecting Proportions for Structural Lightweight Concrete
  - f. ACI 214, Evaluation of Strength Test Results of Concrete
  - g. ACI 301, Structural Concrete
  - h. ACI 304R, Measuring, Mixing, Transporting and Placing Concrete
  - i. ACI 304.2R, Placing Concrete by Pumping Methods
  - j. ACI 305R, Hot Weather Concreting
  - k. ACI 306.1, Cold Weather Concreting
  - l. ACI 308, Curing Concrete
  - m. ACI 309R, Consolidation of Concrete
  - n. ACI 311.1R, ACI Manual of Concrete Inspection
  - o. ACI 315, Details and Detailing of Concrete Reinforcement
  - p. ACI 318, Building Code Requirements for Structural Concrete and Commentary
  - q. ACI 347R, Formwork for Concrete
  - r. ACI SP-2, ACI Manual of Concrete Inspection
  - s. ACI SP-15, Structural Concrete for Buildings
3. American Society for Testing and Materials (ASTM)
  - a. ASTM C31, Making and Curing Concrete Test Specimens in the Field
  - b. ASTM C33, Concrete Aggregates
  - c. ASTM C39, Compressive Strength of Cylindrical Concrete Specimens
  - d. ASTM C42, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - e. ASTM C94, Ready-Mixed Concrete
  - f. ASTM C138, Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete
  - g. ASTM C143, Test Method for Slump of Hydraulic Cement Concrete
  - h. ASTM C150, Portland Cement
  - i. ASTM C156, Test Method for Water Retention by Concrete Curing Materials
  - j. ASTM C171, Sheet Materials for Curing Concrete
  - k. ASTM C172, Sampling Freshly Mixed Concrete
  - l. ASTM C173, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

- m. ASTM C227, Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
  - n. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  - o. ASTM C260, Air-Entraining Admixtures for Concrete
  - p. ASTM C309, Liquid Membrane-Forming Compounds for Curing Concrete
  - q. ASTM C330, Lightweight Aggregates for Structural Concrete
  - r. ASTM C470, Molds for Forming Concrete Test Cylinders Vertically
  - s. ASTM C494, Chemical Admixtures for Concrete
  - t. ASTM C567, Test Method for Determining Density of Structural Lightweight Concrete
  - u. ASTM C595, Blended Hydraulic Cements
  - v. ASTM C618, Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
  - w. ASTM C920, Elastomeric Joint Sealants
  - x. ASTM C989, Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
  - y. ASTM C1077, Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
  - z. ASTM C1107, Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
  - aa. ASTM C1260, Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
  - bb. ASTM D512, Chloride Ion in Water
  - cc. ASTM D516, Sulfate Ion in Water
  - dd. ASTM D1179, Fluoride Ion in Water
  - ee. ASTM D1339, Sulfite Ion in Water
  - ff. ASTM D1751, Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
  - gg. ASTM D1752, Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
  - hh. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
  - ii. ASTM D3867, Nitrite-Nitrate in Water
  - jj. ASTM E96, Test Method for Water Vapor Transmission of Materials in Sheet Form
  - kk. ASTM E329, Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
4. City of New York
- a. New York City Building Code, Local Law 76/2008, latest edition including amendments and supplements
  - b. New York City Board of Standards and Appeals, latest edition including amendments and supplements

5. Concrete Plant Manufacturer's Bureau (CPMB)
  - a. CPMB Concrete Plant Standards of the Plant Manufacturers Bureau
6. Concrete Reinforcing Steel Institute (CRSI)
  - a. CRSI Manual of Practice
7. Corps of Engineers Specifications (CRD)
  - a. CRD C572, Polyvinyl Chloride Waterstop
8. New York State Department of Transportation (NYSDOT)
  - a. NYSDOT Standard Specification - Construction and Materials

#### 1.04 DEFINITIONS

- A. Blending Size: An aggregate that complies with the quality requirements in ASTM C 33 and the paragraph entitled "Aggregates", as modified herein, and can be blended with coarse and fine aggregates to produce a well-graded combined grading.
- B. Cementitious Material: As used herein, shall include Portland cement, fly ash, or ground granulated blast-furnace slag.
- C. Design Strength ( $f'_c$ ): The specified compressive strength of concrete to meet structural design criteria.
- D. Mixture Proportioning: A description of the proportions of a concrete mixture that are selected to enable it to meet the performance durability requirements, workability, specified compressive strength, and constructability requirements.
- E. Mixture Proportions: The concrete supplier's by-mass proportions to replicate the mixture design.
- F. Field Test Strength ( $f_{cr}$ ): The required compressive strength of concrete to meet structural and durability criteria. Determine ( $f_{cr}$ ) during mixture proportioning process.
- G. Normal Weight Concrete: Concrete for which density is not a controlling attribute, produced with aggregates stipulated under ASTM C33, and having a unit weight in the range of 135 to 160 lbs. per cubic foot.
- H. Lightweight Concrete: Concrete intentionally produced to have low density by use of lightweight coarse aggregates stipulated under ASTM C330 and an air-dry unit weight less than 115 lbs. per cubic foot.



- I. Exposed Finish: A general use finish applicable to all formed concrete exposed to view including surfaces which may receive a paint coating.
- J. Unexposed Finish: A general use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.
- K. Inspection Requirements: The inspection requirements of the New York City Building Code, Local Law 76/2008 as defined in Sections 1704.4 for Concrete Construction shall apply to all applicable concrete materials and construction specified in this Section.

#### 1.05 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Materials and workmanship for cast-in-place structural concrete for exterior ramp structures, excluding the bonded concrete overlay, shall conform to Class HP concrete as defined in the NYSDOT Standard Specification. Cast-in-place structural concrete for exterior ramp structures shall meet applicable provisions of Sub-sections 501-1, 501-2 and 501-3 of Section 501 - Portland Cement Concrete; Sub-sections 555-1, 555-2 and 555-3 of Section 555 - Structural Concrete; and Sub-sections 557-1, 557-2 and 557-3 of Section 557 - Superstructure Slabs and Structural Approach Slabs in the NYSDOT Standard Specification.
- B. Materials and workmanship for cast-in-place bonded concrete overlays for exterior ramp structures shall conform to Class 50 DP concrete in accordance with applicable provisions specified in Sub-sections 584-1, 584-2 and 584-3 of Section 584 - Specialized Overlays for Structural Slabs in the NYSDOT Standard Specification.
- C. Concrete Mixture Designs: Applicable to cast-in-place structural normal weight and structural lightweight concrete for use in buildings and site structures unless specified otherwise.
  - 1. Proportion trial mixtures, including the molding and curing of test specimens, or assemble field test data as appropriate, for each class of concrete. Proportion normal weight concrete in accordance with the recommendations of ACI 211.1. Proportion structural lightweight concrete in accordance with the recommendations of ACI 211.2.
  - 2. Establish the required average strength, ( $f_{cr}$ ), of the mixture design on the basis of trial mixtures or documented field test data for each mixture design and proportion concrete mixtures accordingly as specified in ACI 301.
    - a. Employ an independent and experienced testing laboratory acceptable to the Commissioner to prepare the proposed mixture design and required computations from the results of the test specimens in accordance with the provisions of ACI 301. This laboratory shall be responsible for all concrete mixture design and trial batch testing.

- b. Testing laboratory shall have been inspected within the last 2-1/2 years by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology for testing concrete aggregates and for the preparation and testing of concrete trial batches with or without admixtures. The laboratory shall provide documentation indicating how any deficiencies in the latest CCRL inspection report have been corrected.
  - c. Prior to approval, all testing of proposed materials and mixture designs including trial batch and shrinkage testing shall be at the Contractor's expense.
3. Base the concrete design on the materials to be used in the work. If the specified requirements cannot be met, furnish other acceptable materials and/or make necessary changes in the mixing procedure to meet the specified requirements.
4. Design and proportion concrete mixtures to provide an average 28-day compressive strength in excess of the specified 28-day design compressive strength so that the minimum ultimate compressive strength required for each strength class will be obtained.
5. The determination of the concrete mixture proportion to attain the required strength shall be in accordance with the provisions of the New York City Building Code, Local Law 76/2008 unless otherwise specified.
  - a. Proportioning on the basis of field experience and/or trial mixtures shall be in accordance with section 1905.3 of the 2008 New York City Building Code, Local Law 76/2008. Where proportioning on the basis of field experience is used a mixture design employing the same ingredients proposed for use, and used successfully on a previous project, or projects, may be used provided the following are submitted by a licensed concrete testing laboratory and approved by the City of New York.
    - (1) The name and location of the plant from which the concrete will be batched.
    - (2) The concrete mixture design including detailed data and analysis of the ingredients proposed for use as specified herein.
    - (3) Reports for at least 50 consecutive tests of 7-day and 28-day concrete strength tests of the proposed mixture made during the previous twelve months of concrete batched and delivered from the same plant that is to furnish this job. These data shall include an evaluation in accordance with ACI 214 to determine the average strengths, moving averages and the coefficients of variation. In

addition, the results of a minimum of 3 shrinkage tests for this mixture made during the previous twelve months and using the same materials to be used on this project.

- (4) Reports of compliance tests of fine and coarse aggregates made during the above tests.
  - b. For those portions of the work where the Rules, Regulatory or Standard Specifications of agencies other than the Building Department govern, the concrete shall be proportioned in accordance with the applicable Code, Rules Regulations or Standards. Concrete shall be proportioned at a slump not to exceed 4 inches.
  - c. Concrete design mixtures for concrete used in the construction of Transformer Vault, shall not contain fly ash or pozzolan mineral admixture in accordance with Consolidated Edison's prescribed requirements.
6. Design mixture shall meet or exceed each specified property or requirement. Where more than one criterion is specified, conform to the most stringent. For example, a minimum cementitious content or maximum water-cementitious ratio may result in compressive strengths greater than the minimum specified. Likewise, a greater cement content or lower water-cement ratio may be required to achieve the required compressive strength.
7. At the start of construction, mix a full-sized batch, using the accepted materials, the type of mixer and the mixing procedure planned for the project to verify the adequacy of the selected proportions to produce concrete with the required total air content and consistency, and with workability compatible with the intended placing method. This batch will provide the basis for final adjustment of the accepted design.
8. Adjustment to Concrete Mixtures: Mixture design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Submit laboratory test data for revised mixture design for the Commissioner's approval prior to using the revised mixture design in the work. Mixture design adjustments shall be at the sole expense of the Contractor.
9. Mixture design for cast-in-place structural concrete for exterior ramp structures shall conform to Table 501-3 in Section 501 - Portland Cement Concrete of the NYSDOT Standard Specification.
10. Mixture design for the cast-in-place bonded concrete overlay at the exterior ramp structures shall conform to Table 584-1 in Section 584 - Specialized Overlays for Structural Slabs of the NYSDOT Standard Specification.

11. The requirement for a trial batch may be waived if the required test information has been provided in a previous laboratory trial batch run on the identical mixture design within the previous two years. The same brand, type, and source of all materials shall have been used.
  12. Mixture design for the transformer vault shall conform to Consolidated Edison specification E0-1008 – Plain and Reinforced Concrete.
- D. Measurements and Allowable Tolerances: Conform to requirements of cited References in Article 1.03 but provide more restrictive tolerances where required to meet job conditions.
1. Concrete work at exposed surface conditions, including slabs, beams, and walls shall not deviate more than 1/2" from theoretical design locations. Pile caps shall not deviate more than 1" from theoretical design locations.
  2. Concrete Topping or Overlay: Areas to receive concrete topping or overlay shall conform to contour of finished grades indicated and shall not have variations in excess of plus 1/8" in 10'-0" and minus 1/4" in 10'-0".
  3. Variation from a 10-foot straightedge placed in all directions:
    - a. Horizontal and inclined surfaces: 1/8-inch.
    - b. Vertical surfaces: 1/4-inch.
    - c. Eliminate depressions on horizontal surfaces which could hold water.
  4. Out-of-plumb piers, walls, and joints: 1/4-inch in 10 feet, not to exceed one inch total.
  5. Level and grade of slab soffits, beam soffits, and arises: 1/4-inch in any 10 feet length; 3/8-inch in any 20 feet length; not to exceed 3/4-inch for entire surface.
  6. Cross sectional dimensions of beams, and slabs: Plus 1/4-inch, minus 0.
  7. Size and location of sleeves, floor openings, inserts and anchor bolts: 1/4-inch.
  8. Difference between the diagonal dimensions of a rectangular opening: Not more than two percent of the sum of the diagonal dimensions.
  9. Tolerances shall not be cumulative.

#### 1.06 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 1330 - Shop Drawings.

**B. Qualifications Submittals**

1. Contractor's Surveyor: Submit qualifications of the Contractor's licensed Surveyor to adequately survey all sleeves for conduits, deck openings and anchor bolts for future work.
2. Quality Assurance: Develop and submit for approval a quality control plan in accordance with the guidelines of ACI 121R and as specified herein. The plan shall include plans for the concrete supplier, the reinforcing steel supplier, and installer. Maintain a copy of ACI SP-15 and CRSI Manual of Practice at the project site.

**C. Quality Control Submittals****1. Concrete Mixture Designs**

- a. Proposed mixture design method and test data for each class of concrete and for each proposed change of ingredients and ingredient sources, including admixtures, in accordance with the documentation provisions of ACI 301. Identify for each mixture design submitted the method by which proportions have been selected.
- b. Mix proportions conforming to the requirements of the New York City Building Code, Local Law 76/2008 and this Section for water/cement ratio, cement content, slump, maximum size of coarse aggregate, air content, admixtures, and chloride concentration, as well as compressive strength. Mix proportions for structural lightweight concrete shall comply with the recommendations of ACI 211.2.
- c. For mixture designs based on trial mixtures, include laboratory trial mixture proportions, test results and graphical analysis, and indicate required average compressive strength,  $f'_c$ , developed at 7 and 28 days from not less than 3 test cylinders cast for each test and for each design mixture. Indicate quantity of each ingredient per cubic yard of concrete. Indicate type and quantity of admixtures proposed or required. Indicate aggregate gradation for fine and coarse aggregates.
- d. Submit for approval new historical field strength test data, data from new trial mixtures or evidence which indicates that the change will not adversely affect the relevant properties of the concrete prior to changing the brand, type, size or source of cementitious materials, aggregates, water, ice or admixtures.

## 2. Test Reports

- a. Submit following information for review:
  - (1) Types, classes, procedures, names and plant locations for cementitious materials.
  - (2) Types, pit or quarry locations, producers' names, gradations and properties required by ASTM C33 and ASTM C330 for aggregates for the building structure and site structures and by the NYSDOT Standard Specification for the exterior ramp structures.
  - (3) Types, brand names, producers' names for admixtures; and source of supply for water and ice.
- b. Except for admixtures and water, test results not more than 90 days old confirming the conformance of all concrete materials with applicable specifications.
- c. Cement: Submit test results in accordance with ASTM C150 Portland Cement and/or ASTM C595 and ASTM C1157 for blended cement. Submit current mill data.
- d. Fly Ash: Submit test results in accordance with ASTM C618. Submit test results performed within 6 months of submittal date.
- e. Ground Granulated Blast-Furnace Slag: Submit test results in accordance with ASTM C989 for ground iron blast-furnace slag. Submit test results performed within 6 months of submittal date.
- f. Aggregates: Submit test results for aggregate quality for normal weight concrete in accordance with ASTM C33, for aggregate quality for lightweight concrete in accordance with ASTM C330, the combined gradation curve for grading proposed for use in the work and used in the mixture qualification and ASTM C295 for results of petrographic examination. Where there is potential for alkali-silica reaction, provide results of tests conducted in accordance with ASTM C227 or ASTM C1260. Submit results of all tests during progress of the work in tabular and graphical form as noted above, describing the cumulative combined aggregate grading and the percent of the combined aggregate retained on each sieve.
- g. Admixtures: Submit test results in accordance with ASTM C494 and ASTM C1017 for concrete admixtures, ASTM C260 for air-entraining agent, and manufacturer's literature and test reports for corrosion inhibitor admixture. Submitted data shall be based upon tests performed within 6 months of submittal.

- h. Submit samples of materials as requested by the Commissioner including name, source and description of each type of aggregate.
- i. Submit copies of laboratory test reports for concrete materials and mixture design tests. Commissioner's review will be for information only. Production of concrete to comply with the specified requirements shall be the responsibility of the Contractor.
- j. A complete record of the date and details of each concrete placement including the exact location thereof and the date of removal of forms. This record shall be coordinated with and in addition to that maintained by the Commissioner.

### 3. Certifications

- a. Materials, equipment and aggregates approved by the Materials Bureau of the New York State Department of Transportation (NYSDOT), in the NYSDOT publications listed below, are acceptable for use without a detailed submission for review and approval. However, submittal is required to establish the particular material, equipment or aggregate source to be used with approval identification number, and/or page number.
  - (1) M.A.P. Code 7.42-3.1 - Approved Materials and Equipment for use on NYSDOT Projects
  - (2) M.A.P. Code 7.42-3.2 - Approved Sources of Fine and Coarse Aggregates
- b. All materials used in the manufacture of concrete shall be accompanied by a certificate from the manufacturer or supplier indicating test results of current production stockpiles or shipments.
- c. Certifications by the concrete supplier that all concrete ingredients conform to the specified requirements in accordance with ASTM C94. Be advised that the proposed concrete supplier is subject to the City of New York's approval based on experience and past performance on similar projects.
- d. Certifications by the concrete supplier of conformance of mixture designs.
- e. Manufacturer's certification that chloride content of each concrete admixture complies with specified requirements.

- f. Affidavits from an independent testing laboratory certifying that all materials furnished under this Section conform to specified requirements.

4. Material and Product Data

- a. Submit samples of materials as specified and as otherwise may be requested by the Commissioner, including names, sources, and descriptions.
- b. Submit manufacturer's technical data and installation instructions for manufactured materials and products.
- c. Furnish manufacturer's certifications and laboratory test reports as requested by the Commissioner.
- d. Submit notarized certification of conformance to referenced standards when requested by the Commissioner.
- e. Submit technical data from the microsilica admixture supplier to be used in the Class 50 DP concrete that shows that the admixture meets the NYC/NYSDOT requirements regarding fineness, silica content, total chloride ion content, solid contents (slurries) and moisture content (densified powders).

5. Form removal schedule: Submit schedule for form removal indicating element and minimum length of time for form removal. Submit technical literature of forming material or liner, form release agent, form ties, and gasketing to prevent leakage at form and construction joints. Provide a full description of materials and methods to be used to patch form-tie holes.

6. Shop Drawings and Construction Procedures

- a. Proposed concrete placement schedule and shop drawings prior to start of concrete placement operations, including location of all construction, expansion and control joints.
- b. Proposed equipment and method(s) of concrete pumping and conveying.
- c. Proposed equipment and method(s) of concrete placement, vibration and compaction.
- d. Proposed method(s) of concrete curing.
- e. Methods for cold and hot weather mixing, placement, curing and planned protective measures.



- f. Complete information pertinent to a concrete plant to be erected at the site as required by the CPMB Publication "Concrete Plant Standards of the Plant Manufacturers Bureau."
- g. Proposed special procedures for protection of concrete under wet weather placement conditions.
- h. Proposed method of measuring concrete surface temperature changes.
- i. Detailed procedures for removing stains, rust, efflorescence, and surface deposits.
- j. The following information, if ready-mixed concrete is used.
  - (1) Identification of Ready-Mixed Concrete Supplier including the plant location and all pertinent information required by the CPMB Publication "Concrete Plant Standards of the Plant Manufacturers Bureau."
  - (2) Locations of sources of materials for cement, fine and coarse aggregates, and water, and the brands and types of admixtures to be used.
  - (3) Physical capacity of mixing plant.
  - (4) Trucking facilities available.
  - (5) Estimated average amount which can be produced and delivered to the site during a normal 8-hour day, excluding the output to other customers.
  - (6) Estimated travel time to the site.

#### 7. Delivery Tickets

- a. Furnish the Commissioner with a copy of the delivery ticket for each load of concrete delivered to the site. Delivery tickets shall contain all information specified in Section 16.1 of ASTM C94.
- b. Provide batch tickets for each batch of job-site mixed concrete as specified.

### 1.07 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest

edition of each and amendments or supplements thereto. Work of this Section shall conform to all applicable Federal, State and local laws and regulations.

**B. Inspection and Testing**

1. All structural concrete work, including concrete materials and construction operations, shall be subject to special inspection and testing in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
2. Special Inspections
  - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
  - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
  - c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections.
    - (1) Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

- (2) Failure to detect defective work or material shall not in any way prevent rejection should a defect be discovered at a later date nor shall it obligate the Commissioner for final acceptance.
  3. Concrete materials, mixing and placement procedures are subject to special inspection and tests in the plant and field by the Special Inspector. Concrete materials and operations will be inspected and tested by the Special Inspector as the work progresses.
  4. Plant inspections may be made by the Special Inspector at its discretion. Provide at least 72 hours written notice to the Special Inspector prior to the beginning of any concrete materials or mixing work so that inspection may be provided. Furnish all facilities for the inspection of materials and workmanship in the plant, and allow the inspectors free access to the necessary parts of the work.
    - a. Special Inspectors shall have the authority to reject any material or work that does not meet the requirements of this Section.
    - b. Inspection at the plant is intended as a means of facilitating the work and avoiding errors, but it is expressly understood that it will in no way relieve the Contractor from the responsibility for furnishing proper materials or workmanship specified herein.
  5. Concrete materials and installed work may require testing and retesting, as directed by the Commissioner, at any time during the progress of the work. Allow free access to material stockpiles and facilities at all times. Bear the cost of tests not specifically indicated to be performed as special inspection by the Commissioner, including the retesting of rejected materials and installed work.
  6. Other quality control inspection and testing services required by the Contractor to ensure compliance with the Contract Documents for cast-in-place concrete shall be provided by an approved independent inspection and testing agency engaged by and supervised by the Contractor at no additional cost to the City of New York.
- C. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- D. Comply with ACI 301, except as modified herein.
- E. Do not commence furnishing or placement of concrete until concrete mixture designs have been reviewed and approved by the Commissioner.

- F. Closely coordinate the work of this Section with other trades whose work affects, or is affected by, the work of this Section.
- G. Work in Connection with Other Sections and Contracts:
  - 1. Provide all sleeves, inserts, anchors and embedded items required for adjoining work or for its support prior to concreting. No concrete shall be deposited until the Commissioner has inspected the placement of the embedded items and the reinforcing bars and has given permission to place the concrete.
  - 2. Provide ample notice and opportunity to the other trades, whose work is related to the concrete or must be supported by it, to introduce and furnish embedded items before the concrete is placed.
  - 3. Install electrical conduits, junction boxes and pipes prior to concreting in accordance with all requirements of the New York City Building Code, Local Law 76/2008. Protect such installations to the extent that they are not displaced or damaged during the concrete placement.
  - 4. Provide openings in slabs for pipes, conduits and the like required for the work where indicated on the Contract Drawings or Shop Drawings. When work is completed, close up the excess part of the respective openings completely to the pipe sleeve and inserts to match the adjoining work.
  - 5. Provide and set true and to proper alignment in the concrete all sleeves for miscellaneous metal work, castings, pipes and anchors required under this Contract as indicated on the Contract Drawings or required by the manufacturer's templates.
  - 6. Temporarily fill voids in embedments with readily removable material to prevent entry of concrete into the void.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Cement shall be stored in weather-tight buildings, bins or silos which will provide protection from dampness and contamination and will minimize warehouse set.
- B. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation or contamination with other materials or with any other sizes of like aggregates. To insure that this condition is met, any test for determining conformance to requirements for cleanliness and grading shall be performed on samples secured from the aggregates at the point of batching. Frozen or partially frozen particles shall not be used.
- C. Stockpiles of natural or manufactured sand shall be allowed to drain freely to minimize variations in moisture content throughout the stockpile.

- D. Admixtures shall be stored in such a manner as to avoid contamination, evaporation or damage. For those used in the form of suspensions or non-stable solutions, suitable agitating equipment shall be provided to assure uniform distribution of the ingredients. Liquid admixtures shall be protected from freezing and other temperature changes that would adversely affect their characteristics. All admixture containers shall be clearly marked with paint as to their content and dosage.
- E. Do not deliver concrete until forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement.

## 1.09 PROJECT CONDITIONS

### A. Field Measurements

1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
2. Take sufficient field measurements prior to preparation of Shop Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.
3. Actual field-verified conditions may require modifications to the construction details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 CONCRETE QUALITY AND PROPORTIONING

- A. Select concrete proportions to produce the required design strength and provide durability against deterioration and abrasion, watertightness, workability and mixture consistency to facilitate concrete placement, compaction into the forms or metal deck and around reinforcement without segregation or excessive bleeding, and achieve the desired finished appearance.

- B. Durability and Strength: Conform to the applicable requirements of ACI 201.2R and ACI 211.1. Adjust the concrete 28-day design compressive strength to produce cast-in-place concrete of minimum design compressive strength ( $f'_c$ ) as follows:

<u>Item</u>	<u>Concrete Class</u>	<u>28-day Minimum Design Strength (<math>f'_c</math>)</u>
Concrete Workmats	Class 25	2,500 psi
Concrete Curbs, Headers and Sidewalks	Class 30	3,000 psi
Concrete for Buildings, Site Structures	Class 45	4,500 psi
Concrete for Exterior Ramps (NYSDOT)	Class 40 HP	4,000 psi
Structural Lightweight Concrete	Class 40 LT	4,000 psi
Exterior Ramp Overlay (Bonded)	Class 50 DP	5,000 psi
Concrete for Floor Toppings (Unbonded)	Class 45	4,500 psi
Concrete Fill for Steel Pipe Piles	Class 45	4,500 psi
Concrete for Transformer Enclosure	Class 50	5,000 psi

- C. Strength and Water-Cementitious Materials Ratio:

1. Strength requirements shall be based on 28-day compressive strength determined by testing 6-inch by 12-inch cylindrical specimens in accordance with ASTM C39. The specified compressive strength of the concrete ( $f'_c$ ) for each portion of the structure shall meet the requirements in the Contract Documents.
2. Produce cast-in-place concrete with a maximum water-cementitious materials ratio of 0.40 for normal weight concrete and 0.50 for structural lightweight concrete by weight of the total cementitious constituent. In computing the water-cement ratio, water content shall include free surface moisture contained in the aggregate and water content of all liquid admixtures.
3. The minimum amount of portland cement is 70 percent of the total mass of cementitious material. When used, fly ash conforming to ASTM C618 Type F shall be 15 percent by weight of the cementitious material. When used, ground granulated blast-furnace slag conforming to ASTM C989 shall not exceed 15 percent by weight of cement.

- D. Consistency: Proportion the concrete mixture to achieve, at the point of deposit, a maximum slump of 4 inches (without addition of water-reducing admixtures) as determined by ASTM C143, unless indicated otherwise. Where an ASTM C494, Type F or G admixture is used, the slump after the addition of the admixture shall be no less than 6 inches nor greater than 8 inches. Slump tolerances shall comply with the requirements of ACI 117. Maintain slump at lowest value consistent with the ability to satisfactorily place, consolidate and finish concrete.

- E. Air Content: Air entrain all normal weight and structural lightweight concrete. Total air content shall be 5.0 percent by volume in the plastic state within a

tolerance of  $\pm 1.5$  percent, as determined by ASTM C173 or C231, except as noted below.

1. For concrete surfaces that will receive a hard steel troweled or magnesium troweled finish, including the addition of a surface hardener, as specified in Section 03350 - Concrete Finishes, the maximum total air content shall be 3.0 percent.
- F. Slump: The concrete mixture shall be proportioned to have, at the point of deposit, a maximum slump of 4 inches as determined by ASTM C143. Where an ASTM C494, Type F or G admixture is used, the slump after the addition of the admixture shall be no less than 6 inches nor greater than 8 inches. Slump tolerances shall comply with the requirements of ACI 117.
- G. Required Average Strength of Concrete: The minimum compressive strength ( $f_{cr}$ ) of the selected mixture shall equal or exceed the strength required under ACI 301 for laboratory mixture designs. The average compressive strength produced under field tests shall be the minimum compressive strength ( $f_{cr}$ ) required during construction.
- H. Materials shall be proportioned to produce structural lightweight concrete with a calculated equilibrium density of not more than 115 lb/ft<sup>3</sup> as determined by ASTM C567.

## 2.02 MATERIALS

- A. General: Provide materials that meet the minimum requirements specified herein. Materials are applicable to cast-in-place structural concrete for use in buildings and site structures unless specified otherwise.
- B. Portland Cement: ASTM C150, Type I or Type II, or blended hydraulic cement, ASTM C595, Type 1P (MS), except as modified herein. Blended cements shall consist of a mixture of ASTM C150 cement and one of the following materials: ASTM C618 pozzolan or fly ash, or ASTM C989 ground granulated blast-furnace slag. Use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.
1. Type III (high early strength) may be used for cast-in-place concrete placed during cold weather with permission of the Commissioner. Air entraining cement is not permitted.
  2. For cast-in-place concrete for exterior ramp structures, use Type II or Type I/II as specified in Article 501-2.02.A in the NYSDOT Standard Specification.
  3. Use portland cement made by a well-known acceptable manufacturer and produced by not more than one plant. Alternate cement sources may be used provided that a mixture design has been accepted and a trial batch verifying performance has been made.

4. Do not use cement which has deteriorated because of improper storage or handling.
- C. Fly Ash or Pozzolan: Fly ash or pozzolan mineral admixture, when used, shall meet the requirements of ASTM C618 Class F, except as follows:
1. The loss on ignition shall be a maximum of 4 percent.
  2. The maximum percent of sulfur trioxide ( $\text{SO}_3$ ) shall be 4.0.
  3. Fly ash or pozzolan mineral admixture shall not be used for concrete used in the construction of Transformer Vault in accordance with Consolidated Edison's prescribed requirements.
- D. Ground Granulated Blast Furnace Slag:
1. Ground granulated blast furnace slag (GGBF) mineral admixture, when used, shall meet the requirements of ASTM C989, Grade 100 or better.
  2. GGBF slag will be permitted as a substitute for fly ash, at no additional cost to the City of New York, in the event that Class F Fly Ash is not available. The slag substitution shall be in the same proportions and percentages of the total cementitious material as indicated for Fly Ash. A higher percentage of GGBF slag of the total cementitious material in concrete shall be permitted as approved by the Commissioner to suit the project needs.
  3. Laboratory trial batches will be tested to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.
- E. Aggregates
1. Coarse and fine aggregates shall meet the requirements of ASTM C33 with the requirements of Table 3, Class 4S, except for aggregates used for structural lightweight concrete and the construction of exterior ramp structures and substructures. Soundness shall be tested using magnesium sulfate. Abrasion resistance shall be tested using the Los Angeles Abrasion Test. For testing requirements, concrete shall be assumed to be subject to abrasion.
  2. Fine and coarse lightweight aggregates used for structural lightweight concrete shall conform to ASTM C330 and consist of expanded shale, clay or slate material produced by the rotary kiln process.
  3. Fine and coarse aggregates used for construction of exterior ramp structures and substructures shall be in accordance with Article 501-2.02B as specified in the NYSDOT Standard Specification.



4. Where historical data is used, provide aggregates from the same sources having the same size ranges as those used in the concrete represented by historical data.
5. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces. Marine dredged aggregates shall not be used. Provide aggregates containing no deleterious material properties as identified by ASTM C295.
6. The loading, storing, unloading, and batching of aggregates shall be conducted in such a manner as to prevent segregation, intermingling, or the inclusion of foreign materials. All aggregates shall remain in free drainage storage until a stable moisture content is attained prior to placement in the batching plant bins. Each size of coarse aggregate and the fine aggregate shall be kept in separate hoppers or bins. All aggregates shall be delivered to the batching plant bins by a belt conveyor or other approved means; and the operation thereof shall be controlled so as to prevent the mixing of the sizes and kinds of aggregates with each other. Any mixture of fine and coarse aggregates or of the two sizes of coarse aggregate in the batching plant bins or prior thereto shall be cause for rejection of such materials, and the affected bin or bins shall be emptied and inspected prior to refilling with the correctly graded aggregate.
7. Provide aggregates for exposed concrete from one source in accordance with ASTM C227. Do not provide aggregates that react deleteriously with alkalies in cement.
8. If ASTM C1260 considers aggregate to be potentially reactive with alkalies in the cement, mix design shall be tested as described in Paragraph 2.02G.
9. Fine aggregates for normal weight concrete
  - a. ASTM C33 including restrictions on reactive materials except that loss when tested for soundness using magnesium sulfate shall not exceed 12 percent.
  - b. Fine aggregate shall be composed of clean, sharp, hard, strong, durable, insoluble, uncoated, natural sand free from loam, clay lumps or other deleterious substances.
  - c. Dune sand, bank run sand and manufactured sand are not acceptable.
  - d. Sand having FM less than 2.40 or greater than 3.00 will not be allowed.

## 10. Coarse aggregate for normal weight concrete

- a. ASTM C33, Size No. 57, Class 4S, including restrictions on reactive materials except that loss when tested for soundness using magnesium sulfate shall not exceed 12 percent. For composite steel floor deck, concrete stairs and stair treads, use a mixture with a maximum coarse aggregate of 1/2 inch.
- b. Coarse aggregate shall be crushed stone processed from natural rock or stone and shall consist of clean, hard, strong, durable, insoluble, unweathered, and uncoated pieces of uniform quality throughout; and shall be free from such alkali, decomposed minerals, organic material, clay, mica, schist, or other foreign matter that will render it unsuitable.
- c. Use of slag and pit or bank run gravel is not permitted, nor clay lumps in excess of 1.0 percent by weight of coarse aggregate.

## 11. Combined Aggregate

- a. Aggregate gradations shall be judged based upon the combined gradation and particle distribution in the mixture of coarse and fine aggregates.
  - b. The combined aggregates shall be well graded from coarsest to the finest with not more than 18 percent nor less than 8 percent retained on each individual sieve between the coarsest size and the No. 50 sieve and the nominal maximum aggregate size sieve. The No. 100 and finer sieves shall have less than 8 percent retained. Use blending sizes where necessary, to provide a well graded combined aggregate. Maximum aggregate size shall be 1".
  - c. Fine aggregate and coarse aggregate sizes specified shall be combined in proportions as needed to meet the requirements specified herein for combined aggregate. The total quantity of fine aggregate shall not exceed 41 percent by weight of total aggregate for normal weight concrete.
  - d. Gradations of combined aggregate shall be plotted and submitted on:
    - (1) A combined grading chart (percent passing versus sieve size) on which the limits noted above shall be plotted.
    - (2) An aggregate Particle Distribution Chart (percent retained versus sieve size).
- F. Water: Clean, potable and free of substances that may be objectionable to concrete or steel. Water shall meet the requirements of ASTM C94 and the chloride and sulfate limits in accordance with ASTM D512 and ASTM D516. Mixing water

shall not contain more than 500 parts per million of chlorides as Cl and not more than 100 parts per million of sulfates as SO<sub>4</sub>. Water shall be free from injurious amounts of oils, acids, alkalies, salts, and organic materials.

#### G. Alkali-Silica Reaction

1. Concrete mix containing aggregates considered potentially reactive by ASTM C1260 shall be considered acceptable if the expansion as measured by ASTM C1260 (modified) is not greater than 0.08 percent at 16 days. Mix designs not meeting this requirement will be rejected.

#### H. Concrete Admixtures

1. Calcium Chloride: Not permitted. Do not use calcium chloride or admixtures containing chlorides, thiocyanate, or more than 0.05 percent chloride ions other than impurities from admixture ingredients.
2. Provide approved chemical admixtures produced and serviced by established, reputable manufacturers that comply with the requirements shown below and in accordance with manufacturer's recommendations, and appropriate for the climatic conditions and the construction needs.
3. Concentrations of corrosion-inducing chemicals shall not exceed limits shown below.

##### Limits on Corrosion-Inducing Chemicals

<u>Chemical*</u>	<u>Limits, Percent**</u>	<u>Test Method</u>
Chlorides	0.10	ASTM D512
Fluorides	0.10	ASTM D1179
Sulphites	0.13	ASTM D1339
Nitrates	0.17	ASTM D3867

\* Limits refer to water-soluble chemicals

\*\* Limits are expressed as a percentage of the mass of the total cementitious materials.

4. The total alkali content shall not increase the total sodium-oxide equivalent alkali content of the concrete by more than 0.5 lb/CY.
5. Air-Entraining Admixture: Provide a product conforming to requirements of ASTM C260, certified by manufacturer to be compatible with other selected admixtures.
6. Water-Reducing Admixture: Provide a product conforming to requirements of ASTM C494 Type A.

7. Accelerating Admixture: Provide a product conforming to requirements of ASTM C494 Type C.
8. Retarding Admixture: Provide a product conforming to requirements of ASTM C494 Type B or G.
9. Water-Reducing and Retarding Admixture: Provide a product conforming to requirements of ASTM C494 Type D.
10. Water-Reducing and Accelerating Admixture: Provide a product conforming to requirements of ASTM C494 Type E.
11. High Range Water-Reducing Admixture: Provide a product conforming to requirements of ASTM C494 Type F.
12. Corrosion Inhibiter
  - a. Provide corrosion inhibiting admixture containing a minimum of 30 percent calcium nitrite by mass, conforming to the requirements of Section 711-13 of the NYSDOT Standard Specifications.
  - b. Dosage shall be 3.0 gallons per cubic yard for normal weight concrete for transfer station building, pier deck and ramp structures. The quantity of mix water shall be adjusted to account for the water portion of the calcium nitrite solution. Water content of corrosion inhibitor shall be considered as 7.3 pounds per gallon in computing the water/cement ratio of the overall mix.
  - c. Retarding admixtures shall be provided as needed, since the calcium nitrite solution accelerates setting time, unless the admixture has been specifically formulated to not accelerate setting.
  - d. Products: Subject to compliance with requirements, provide one of the following:
    - (1) DCI or DCI-S; Grace Construction Products, Cambridge, MA
    - (2) Rheocrete CNI; Master Builders, Inc., Cleveland, OH
    - (3) Anti-Hydro NC; Anti-Hydro International, Inc., Flemington, NJ
    - (4) Eucon CIA; Euclid Chemical Company, Cleveland, OH
    - (5) Or approved equal
13. Microsilica Admixture for Class 50 DP bonded concrete overlay on exterior ramp structures: Provide a product conforming to slurry or densified powder included on the list of approved products for New York City/New York State Department of Transportation. When slurries are used, they shall be agitated to prevent separation and shall be maintained at a temperature above 32° F. at all times.

## 2.03 EPOXY BONDING AGENT

- A. Provide a two-component epoxy-resin bonding agent conforming to ASTM C881. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40° F.; Class B if placement temperature is between 40 and 60° F.; or Class C if placement temperature is above 60° F.
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Sikadur 32, Hi-Mod LPL; Sika Corporation, Lyndhurst, NJ
  2. Eucopoxy LPL; Euclid Chemical Company, Cleveland, OH
  3. Or approved equal

## 2.04 CURING AND PROTECTION MATERIALS

- A. Provide curing materials that will not stain or affect concrete finish or lessen the concrete strength and comply with the following requirements:
1. Pervious Sheeting: Use materials conforming to AASHTO M182, Class 3; burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard.
  2. Curing mats shall be heavy carpets or cotton mats, quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.
  3. Impervious Sheeting: Use materials conforming to ASTM C171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.
  4. Liquid Membrane-Forming Compounds
    - a. Use material meeting the requirements of ASTM C309, Type 1 or Type 1-D, Class A or B and is VOC compliant. Be advised that removal of the curing compound may be required prior to the installation of certain floor finishes and concrete finish treatments or coatings in accordance with the manufacturer's recommendations and as described in Section 03350 – Concrete Finishes.
    - b. Products: Subject to compliance with requirements, provide one of the following:
      - (1) Kure-N-Seal; Sonneborn/BASF Admixture Systems, Cleveland, OH

- (2) L&M Cure R; L&M Construction Chemicals, Inc., Omaha, NE
- (3) KurezDR-100; Euclid Chemical Co., Cleveland, OH
- (4) Or approved equal

5. Insulation Blankets

- a. Closed cell flexible foam sheet material such as polystyrene or urethane. Provide foam sheet material which is capable of being bent 90° F. without breaking or tearing at corners. The foam insulation blankets shall be 1/2-inch thick.
- b. Quilted, flexible insulation blankets that retain their insulating value when wet and which retard the evaporation of water.

2.05 PREFORMED COMPRESSIBLE JOINT FILLER

- A. Use a preformed compressible joint filler composed of closed-cell polyethylene foam or closed-cell synthetic foam of isomeric polymers at expansion joints in cast-in-place concrete work as indicated on the Contract Drawings. Provide compressible joint filler that meets the requirements of ASTM D1751 or ASTM 1752, Sections 5.1 through 5.4, except that the compression requirement shall not be less than 100 psi and not greater than 250 psi to compress the test specimen to 50 percent of its thickness.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Sealtight Ceramar; W.R. Meadows, Inc., Hampshire, IL
  2. Expansion-Joint Filler; BASF Building Systems, Shakopee, MN
  3. Or approved equal

2.06 JOINT SEALANT AND BACKER ROD

- A. Use a moisture-cured, single-component, polyurethane base, non-sag, gun-grade elastomeric sealant compound at new expansion joints and control joints in cast-in-place concrete work as indicated on the Contract Drawings. Provide joint sealant that meets the requirements of ASTM C920, Type S, Grade NS, Class 25 and Use T or NT as applicable. Provide a backer rod that is closed-cell polyethylene foam rod, non-gassing with a diameter as recommended by the manufacturer for the joint width indicated. Use a backer rod that is compatible with the joint sealant and acceptable to the joint sealant manufacturer.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Sikaflex 1-a; Sika Corporation, Lyndhurst, NJ
  2. Eucolastic I; Euclid Chemical Company; Cleveland, OH
  3. Sonolastic SL-1; BASF Building Systems, Shakopee, MN
  4. Or approved equal

## 2.07 CONSTRUCTION JOINT FILLER

- A. Provide a two-component, self-leveling, elastic type, modified epoxy or polyurea joint filler for filling and sealing narrow grooves in horizontal construction and control joints. Joint sealer shall be suitable to protect concrete joint edges in heavy duty, industrial concrete floors and wearing surfaces subject to abrasion, heavy traffic and concentrated loads. Suitable for applications where anticipated joint movement will not exceed 10 percent of opening width. Provide joint filler capable of 100 percent elongation with a minimum tensile strength of 325 psi, a Shore A hardness between 75 and 95 and minimum adhesion strength to concrete of 200 psi.
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Groove and Crack Filler #250; Anti-Hydro International, Inc., Flemington, NJ
  2. TF-100 Control Joint Filler, BASF Building Systems, Shakopee, MN
  3. Or approved equal

## 2.08 EPOXY RESIN FOR GROUTING DOWELS

## A. Vertical Dowels

1. Provide a two-component, 100-percent solids, moisture-tolerant, high-modulus epoxy resin specifically intended for grouting vertical dowels.
2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Sikadur 32, Hi-Mod; Sika Corporation, Lyndhurst, NJ
  - b. E<sup>3</sup>-F High Flow Epoxy Grout System; Euclid Chemical Company, Cleveland, OH
  - c. Masterflow MP, BASF Building Systems, Shakopee, MN
  - d. Or approved equal

## B. Horizontal Dowels

1. Provide a two-component, 100-percent solids, moisture-tolerant, high-modulus epoxy resin specifically intended for grouting horizontal dowels.
2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Sikadur 31, Hi-Mod Gel; Sika Corporation, Lyndhurst, NJ

- b. Duralcrete Gel Epoxy System; Euclid Chemical Company, Cleveland, OH
- c. Or approved equal

## 2.09 NON-SHRINK GROUT

- A. Provide a non-shrink, non-metallic, ready-mix grout conforming to the requirements of ASTM C1107, Grade A, where indicated on the Contract Drawings.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. SikaGrout 212; Sika Corporation, Lyndhurst, NJ
  - 2. Masterflow 713 Plus; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
  - 3. NS Grout; Euclid Chemical Company, Cleveland, OH
  - 4. Or approved equal

## 2.10 PVC WATERSTOPS

- A. Provide an extruded, ribbed-type virgin polyvinyl chloride (PVC) waterstop where indicated on the Contract Drawings that conforms to the requirements of CRD C572. Waterstops shall be extruded from high-quality PVC resins that are plasticized and stabilized to offer long-life performance, resistance to abrasion and attack by ozone, oxygen, alkalies and waterborne chemicals. Provide waterstop that has a Shore A durometer between 65 and 75, tensile strength not less than 1,850 psi and specific gravity not more than 1.38. No reclaimed PVC materials shall be used in the manufacture of the waterstops.
- B. PVC waterstops for construction joints shall be the flat ribbed type, 6 inches wide, with a minimum thickness of 3/8 inch adjacent to the hollow center bulb.
- C. PVC waterstops for expansion joints shall be ribbed with a center bulb, 9 inches wide with a minimum thickness at any point of 3/8 inches. The center bulb shall have an outside diameter of not less than 1-3/8 inches.
- D. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Model 679 for construction joints and Model 738 for expansion joints; Greenstreak, St. Louis, MO
  - 2. Sealtight Model 6380 for construction joints and Sealtight Model 9380 for expansion joints; W.R. Meadows, Hampshire, IL



3. Or approved equal

## 2.11 MISCELLANEOUS MATERIALS

- A. Pipe Sleeves: Sleeves for conduits and pipes shall be PVC Schedule 40 conforming to provisions of ASTM D1785.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. For footings, pile caps, grade beams and slabs-on-grade, verify that subbase materials are properly compacted and in acceptable condition upon which to construct cast-in-place concrete.
- C. Verify that vapor barrier or membrane waterproofing has been installed where indicated on the Contract Drawings.
- D. Verify that formwork is properly constructed in conformance with Section 03100 – Concrete Forms and Accessories.
- E. Verify that reinforcement, supports, anchors, inserts, sleeves and other embedded items are accurately placed in conformance with Section 03200 – Concrete Reinforcement, are secured in position and will not interfere with proper placement of concrete.
- F. Verify that requirements for concrete cover to reinforcement are satisfied.
- G. Verify that anchor bolts are located as shown on approved anchor bolt layout drawings and are set accurately to templates and protected from damage.
- H. Provide ample notice and opportunity to other trades, whose work is related to the concrete or must be supported by it, to introduce and furnish embedded items before the concrete is placed.
- I. Coordinate through the Commissioner and provide sufficient clearance between reinforcement for drilled-in adhesive anchor for railings, miscellaneous structures, equipment, devices and those likely to be installed by other trades.

### 3.02 JOINT CONSTRUCTION

#### A. Construction Joints

1. Do not install horizontal construction joints except as shown on the Contract Drawings.
2. If additional construction joints are desired, secure the Commissioner's approval of joint design and location prior to start of concrete placement.
3. Install construction joints with 2-inch deep keyways in accordance with the details indicated on the Contract Drawings. Support joint forms adequately so as to rigidly maintain their positions during placement, vibration and hardening of concrete.
4. Continue reinforcement across and perpendicular to construction joints unless details specifically indicate otherwise. Do not locate lapped splice of reinforcement across construction joint.
5. Do not place new concrete adjacent to previously placed concrete at construction joint until at least 48 hours has elapsed since the initial placement.

#### B. Waterstops

1. Install specified waterstops where indicated on the Contract Drawings.
2. Use continuous lengths without splices, except as otherwise indicated on the Contract Drawings.
3. Connect all adjoining waterstops, including vertical and horizontal runs, in such a manner as to provide a continuous water barrier in accordance with manufacturer's recommendations and as indicated on the Contract Drawings.
4. Splices
  - a. Strength: Not less than that of the parent section
  - b. Watertightness: Make equal to that of continuous material
  - c. Polyvinyl Chloride: Heat seal adjacent surfaces in accordance with manufacturer's recommendations using a thermostatically controlled electric source of heat that provides sufficient heat to melt but not to char the material

**C. Expansion Joints and Control (Contraction) Joints**

1. Install at locations shown or noted on the Contract Drawings.
2. Construct control (contraction) joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Form control (contraction) joint by means of a wood strip, plastic strip, metal plate, or other approved material to be subsequently removed. Sawed joints shall be completed within 4 to 12 hours after concrete placement.
3. Provide 1/2-inch by 1/2-inch preformed recess at top of control (contraction) joint where indicated on the Contract Drawings and fill with joint sealant in accordance with sealant manufacturer's instructions.
4. Do not extend reinforcing steel or other embedded metal items through expansion joints except where indicated otherwise on the Contract Drawings.
5. Expansion joints shall extend the full depth of the concrete element. Fill expansion joints full depth with preformed compressible joint material, backer rod and joint sealant as described herein and as shown on the Contract Drawings.
6. When concrete placement is to be discontinued for more than 45 minutes and if the construction plane is to be horizontal, install keyways and embed dowel bars in the concrete before initial hardening. Use keyways and dowels in vertical concrete construction except when indicated or directed otherwise by the Commissioner.

**3.03 DRILLING AND GROUTING DOWELS WITH EPOXY RESIN**

- A. Drill holes for each dowel to the size and depth indicated on the Contract Drawings. Do not drill into or cut or otherwise damage existing reinforcement bars unless permitted by the Commissioner.
- B. Blow clean each finished hole with an air jet and then flush with a jet of clean water.
- C. Immediately prior to the grouting operation, remove all water from the hole and from the walls of the hole.
- D. Mix and place the epoxy resin completely around the dowel bar in strict accordance with the manufacturer's recommendations, with particular attention given to manufacturer's specified time limit within which the material must be placed after mixing. Do not retemper resin that has begun to stiffen; discard such resin.

## 3.04 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

- A. General: Comply with requirements of ASTM C94 and ACI 301, for batching, mixing and transporting concrete, and as modified herein.
- B. Mixing: Conform to the provisions of ASTM C94 and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixtures throughout the batch. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85° F.
  - 1. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85° F. except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes.
  - 2. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.
  - 3. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits.
- C. Transporting
  - 1. Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete that has segregated in transporting and dispose of as directed.
  - 2. Do not use concrete that has stood for over 30 minutes after leaving the mixer, or concrete that is not placed within 90 minutes (or 60 minutes as specified herein) after water is first introduced into the mix.

## 3.05 PLACING CONCRETE

- A. Preparation
  - 1. Remove foreign matter accumulated in the forms.
  - 2. Rigidly close openings left in the formwork.

3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.
  4. Use only clean tools.
- B. Application of Epoxy Bonding Agent: Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is tacky. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with epoxy resins.
- C. Conveying
1. Perform concrete placing at such a rate that concrete, which is being integrated, with fresh concrete is still plastic.
  2. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
  3. Do not use concrete, which becomes non-plastic and unworkable, or does not meet required quality control limits, or has been contaminated by foreign materials.
  4. Remove rejected concrete from the job site.
  5. Do not drop concrete more than 60 inches without the aid of an "elephant trunk" or similar device that prevents aggregate separation.
  6. Placing concrete in forms:
    - a. Deposit concrete in horizontal layers not deeper than 24 inches, and avoid inclined construction joints.
    - b. Remove temporary spreaders in forms when concrete has reached the elevation of the spreaders.
- D. Placing Concrete Slabs
1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
  2. Dry-screed slab surfaces to the correct level using continuous intermediate screed strips, continuous edge forms, or continuous bulkheads as appropriate, set to the proper elevation and slope and spaced at a maximum width of 12 feet.

3. Intermediate screed strips are required at all locations where sloped slabs intersect. Slope slabs toward drains as indicated on the Contract Drawings. The use of wet-screed guides is prohibited.
  4. Use bullfloats to smooth the surface, leaving the surface free from bumps and hollows.
  5. Do not sprinkle water on the plastic surface. Do not disturb the slab surface prior to start of finishing operations.
- E. Pumping: Conform to ACI 304R and ACI 304.2R. Pumping shall not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment shall not exceed 2 inches. Do not use pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Maximum size of well-rounded aggregate shall be limited to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.
- F. Hot and Cold Weather Requirements
1. Follow the recommendations of ACI 305R and ACI 306.1 for placement of concrete during hot and cold weather conditions, respectively, and as specified herein.
  2. Do not place concrete if its temperature at the time of placement exceeds 90° F and every effort has been made to maintain lower temperatures. If the temperature of the concrete being placed is consistently above 75° F and a noticeable decrease in slump occurs, use a retarding admixture.
  3. During hot weather, protect unformed surfaces of concrete from drying by continuous moist curing for at least 24 hours, except for concrete surfaces that have received a surface hardener. Commence curing as soon as the concrete has hardened sufficiently to withstand surface damage. If moist curing is not carried beyond 24 hours, cover the surface while damp with a suitable heat-reflecting plastic membrane or spray with a white pigmented curing compound.
  4. In the fall, from the time of the first frost and until the mean daily temperature at the site falls below 40° F, protect concrete from freezing for at least 24 hours after it is placed. When the daily mean temperature falls below 40° F, refer to subparagraphs 5 and 6 below. Protect concrete placed in the spring after the mean daily temperature at the site rises above 40° F until the danger of freezing is passed.
  5. Do not allow concrete temperature to decrease below 50° F. Obtain approval prior to placing concrete when ambient temperature is below 40° F. or when

concrete is likely to be subjected to freezing temperatures within 24 hours. When daily mean temperatures are generally below 40° F, maintain the temperature of the concrete at the time of placement not less than that specified in Chapter 3 of ACI 306.1 and continue to maintain the concrete at the recommended placement temperature for the duration specified in Chapter 5 of ACI 306.1. Initiate heating of aggregates, mixing water or both as needed to obtain the recommended placement temperatures. Do not permit the concrete temperature as mixed to exceed 45° F above the values specified in Lines 2, 3 and 4, as applicable, of Table 3.1 in ACI 306.1.

6. Maintain the temperature of concrete in place at 50° F or above by keeping forms in place, covering concrete with insulating materials, heated enclosures or employing combinations of these measures. Vent combustion heaters and do not heat or dry the concrete locally. Cure concrete during the period of temperature protection for such additional time as may be required to prevent exposed concrete surfaces from freezing or drying out.

- G. Depositing Concrete under Water: ACI 301 methods and equipment used shall prevent the washing of the cement from the mixture, minimize the formation of laitance, prevent the flow of water through the concrete before it has hardened, and minimize disturbance to the previously placed concrete. Do not deposit concrete in running water or in water temperatures below 35° F. Tremies, if used, shall be watertight and sufficiently large to permit a free flow of concrete. Keep the discharge end continuously submerged in fresh concrete. Keep the shaft full of concrete to a level well above the water surface. Discharge and spread the concrete by raising the tremie to maintain a uniform flow. Place concrete without interruption until the top of the fresh concrete is at the required height.

### 3.06 CONSOLIDATION

- A. Consolidate each layer of concrete immediately after placing, by use of internal motorized concrete vibrators supplemented by hand spading, rodding or tamping. Comply with the requirements of ACI 309R using vibrations with a minimum frequency of 9,000 vibrations per minute.
- B. Do not vibrate forms or reinforcement.
- C. Do not use vibrators to transport concrete inside the forms.

### 3.07 CONCRETE FINISHING

- A. Concrete finishing of formed and unformed surfaces shall comply with the requirements of Section 03350 - Concrete Finishes.
- B. Placement and finishing of concrete toppings on freshly placed or on hardened concrete shall conform to the provisions of ACI 301 and Section 03350 - Concrete Finishes.

## 3.08 CURING AND PROTECTION

- A. General: Comply with the recommendations of ACI 301 and ACI 308 unless otherwise specified. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Prevent concrete from drying by misting surface of concrete until curing commences. Begin curing immediately following final set. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, by rain or running water, adverse weather conditions, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period.
- B. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period.
- C. Employ water or liquid membrane-forming compound curing methods in accordance with ACI 308. For bonded concrete overlay on exterior ramp structures, follow requirements of Article 584-3.06 of NYSDOT Standard Specifications.
- D. Moist Curing
  - 1. Ponding or Immersion: Continually immerse the concrete throughout the curing period. Water shall not be 20° F less than the temperature of the concrete. For temperatures between 40° F and 50° F, increase the curing period by 50 percent. Remove water without erosion or damage to the structure.
  - 2. Fog Spraying or Sprinkling: Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50° F, increase the curing period by 50 percent.
  - 3. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.
  - 4. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface



and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

- E. Application Rate of Liquid Membrane-Forming Compounds: Compound shall restrict the loss of water to not more than 0.113 lb/SF of surface area in 72 hours when tested in accordance with ASTM C156 at the coverage rate recommended by the manufacturer.
1. Submit a letter from the manufacturer stating that the coverage rate of liquid membrane-forming compound meets this restriction in loss of water.
  2. Curing Periods: Moist cure concrete using potable water continuously for a minimum of seven (7) days at an ambient temperature above 40° F. Continue additional curing for a minimum total period of 14 days. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Commissioner.
  3. Protection of Treated Surfaces: Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.
- F. Maintenance of Traffic: Restrict vehicular and pedestrian traffic from traveling on newly placed concrete floor slabs until the concrete has attained 75 percent of its minimum ultimate compressive strength as verified by three (3) compressive strength tests.

### 3.09 PREFORMED COMPRESSIBLE JOINT FILLER INSTALLATION

- A. Install compressible joint filler where indicated on the Contract Drawings and in accordance with the manufacturer's instructions and recommendations.

### 3.10 JOINT SEALANT AND BACKER ROD INSTALLATION

- A. Install joint sealant to finish expansion joints where indicated on the Contract Drawings. Provide joint widths and sealant depths as shown, except that sealant depth shall not exceed 1/2 inch.

- B. Prepare joint surfaces to a sound, smooth, clean and dry condition free of visible contaminants. Where recommended by sealant manufacturer, apply compatible primer to dry joint surfaces.
- C. Control the depth of the sealant with the use of compatible joint fillers and backup materials. Install joint backing with approximately 30 percent compression to provide uniform depth of sealant in accordance with manufacturer's recommendations.
- D. Install joint sealant in strict accordance with manufacturer's recommendations.

### 3.11 CONSTRUCTION JOINT FILLER

- A. Provide narrow recess at the top of construction joints in the concrete wearing surface at the tipping and loader floor levels as shown on the Contract Drawings.
- B. Prepare joint surfaces to a sound, smooth, clean and dry condition free of visible contaminants.
- C. After taping both sides of the joint, fill joint cavity flush or slightly higher than adjacent concrete surface with epoxy resin. Apply by brush or pour cans in accordance with the manufacturer's instructions.

### 3.12 NON-SHRINK GROUT

- A. Install non-shrink grout where indicated on the Contract Drawings and in accordance with the manufacturer's instructions and recommendations. In particular, follow manufacturer's instructions closely regarding surface preparation, mixing, placement and curing procedures.

### 3.13 FIELD QUALITY CONTROL

- A. General: Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 for structural concrete work, including concrete materials and construction operations, will be provided by the Special Inspector. The Special Inspector will arrange for plant inspection of concrete materials at the mixer, concrete placement, and for the sampling and testing of concrete cylinders.
  - 1. Cooperate with the Special Inspector in the performance of its duties for special inspection. Assist the Special Inspector in performing all sampling and testing specified under Field Quality Control during construction by providing incidental labor to collect and store samples.
    - a. In cold weather conditions, provide a uniformly heated enclosure (minimum 65°F) for on-site storage of test cylinders until the testing laboratory picks them up.

2. The Special Inspector will have a qualified representative(s) at the job site to perform concrete testing and to make all necessary test cylinders. Do not place concrete without the Special Inspector's on-site inspector present.
3. The Special Inspector will also be responsible for curing, capping and breaking test cylinders used for compressive strength tests performed in the laboratory.
4. Concrete inspection and testing will include but not be limited to the following:
  - a. Forms will be inspected to see that they are in the correct location and that they will result in concrete of the required dimensions as shown on the Contract Drawings.
  - b. Reinforcement installations will be checked for size, bending, spacing, location, firmness of installation, and surface condition. Reviewed shop drawings will be used in conjunction with the Contract Documents.
  - c. Operations of mixing, conveying, placing, compacting, finishing, and curing of concrete will be inspected and will include control of field proportioning and field testing.
5. The Special Inspector will also be responsible for the following additional field inspection services:
  - a. Inspect concrete batching, mixing, and delivery operations in accordance with special inspection requirements of the New York City Building Code, Local Law 76/2008.
  - b. Check batching and mixing operations.
  - c. Review the manufacturer's report of each shipment of cement, aggregates and reinforcing steel and/or conduct laboratory spot checks of these materials as received.
  - d. Inspect the location and dimension of the forms, the placing of the reinforcing steel and the placing, conveying and depositing of the concrete.
  - e. Sample concrete at point of placement and other locations directed by the Commissioner and perform required tests.
  - f. Additional inspection and testing required because of changes in materials or mixture proportions requested by the Contractor. When required, such testing shall be performed at the Contractor's expense.

6. Identification: The Special Inspector will identify each test by number, mix, amount of admixture, origin of sample in the project, the date test specimen was made, the date test specimen was tested, the amount of slump determined, and the compressive strength test results.
7. Should test(s) yield results which do not meet the requirements of these specifications, the Contractor may be required to perform coring for additional testing and/or replacement of defective concrete.

**B. Evaluation of Mixture Designs (Using Test Slab and Wall)**

1. The adequacy of the concrete design mixture to produce the minimum specified strength and durability will be confirmed by testing field batches; casting concrete in a test slab and a test wall at the job using approved materials, equipment, and personnel; and testing the hardened concrete as described herein. The Contractor shall cast the test slab and wall in accordance with requirements specified herein. The slab shall be at least 8 feet square and have thickness of at least 8 inches. The wall shall be 8 feet long, 4 feet high and at least 8 inches thick. Slump shall not exceed the slump proposed for the work. The castings shall be water cured for a minimum of 7 days.
2. The fresh concrete will be tested as follows:
  - a. Slump in accordance with ASTM C143.
  - b. Air content in accordance with ASTM C231 or ASTM C173.
  - c. Unit weight in accordance with ASTM C138.
  - d. For strength, nineteen (19) 6-inch by 12-inch cylinders will be cast in accordance with ASTM C31/C31M.
3. The 6-inch by 12-inch cylinders cast under subparagraph 2d above will be tested as follows:
  - a. Each specimen will be measured and weighed to determine unit weight as they are stripped from the molds.
  - b. Test specimens will be tested at each age for pulse velocity through concrete in accordance with ASTM C597.
  - c. Two specimens will be tested at each age of 24 hours and 3 and 7 days in accordance with ASTM C39.
  - d. Three specimens will be tested at each age of 28, 56, and 90 days in accordance with ASTM C39.

- e. Two specimens will be tested at each age of 28 and 90 days in accordance with ASTM C496.
- 4. Twenty-five (25) additional 4-inch diameter hardened cores will each be extracted from the test slab and test wall in accordance with ASTM C42. Those to be tested at 7 days or earlier age will be drilled on the test date and tested as cored. Those to be tested at later ages will be drilled in adequate time for wet curing before testing. Cores will be tested as follows:
  - a. All cores will be tested at each age for pulse velocity through concrete in accordance with ASTM C597.
  - b. Two cores will be tested for static modulus of elasticity in accordance with ASTM C469 at age 28 days.
  - c. Two cores will be tested for specific gravity, absorption, and voids in concrete in accordance with ASTM C642.
  - d. Three cores will be tested for resistance to chloride ion penetration in accordance with ASTM C1202 at ages 28 and 90 days.
  - e. Compressive strength in accordance with ASTM C39 as follows:
    - (1) Two cores at 24 hours
    - (2) One core at 3 days
    - (3) Two cores at 7 days
    - (4) Three cores at 28 days
    - (5) Two cores at 90 days
    - (6) Three spare cores
- 5. Sampling and determination of water-soluble chloride ion content shall be determined in accordance with ASTM C1218/C1218M. Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed 0.08 percent by weight of cement for non-prestressed concrete and 0.06 percent by weight of cement for prestressed concrete.
- 6. Test results will be submitted to the Commissioner for evaluation and acceptance.

#### C. Sampling

- 1. Sampling shall conform to ASTM C172. Samples of fresh concrete will be collected to perform tests specified. ASTM C31/C31M shall be followed for making test specimens.

2. Concrete will be sampled on a random basis except where a batch appears to be deficient and the test can be used to verify the observed deviation. Identify samples so taken in a manner that they can be isolated from other tests. At least one sample will be obtained for each 50 cubic yards, or fraction thereof, of each design mixture of concrete placed in any one day. When the total quantity of concrete with a given design mixture is less than 50 cubic yards, the strength tests may be waived by the Commissioner, if in his judgment, adequate evidence of satisfactory strength is provided.

#### D. Testing

1. The Special Inspector will immediately notify the Contractor and the Commissioner of any test results, which do not conform to specified requirements.
2. Slump Tests: Conform to ASTM C143. Concrete samples will be taken during concrete placement. The maximum slump may be increased as specified with the addition of an approved high range water reducing (HRWR) admixture provided that the water-cement ratio is not exceeded. Tests will be performed at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.
3. Temperature Tests
  - a. The concrete delivered and the concrete in the forms will be tested. Tests will be conducted in hot or cold weather conditions below 50° F. and above 80° F. for each batch (minimum) or every 10 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.
  - b. The temperature of each composite sample will be determined in accordance with ASTM C1064. When the average of the highest and lowest temperatures during the period from midnight to midnight is expected to drop below 40° F for more than 3 successive days, concrete shall be delivered to meet the following minimum temperature at the time of placement:
    - (1) 55° F for sections less than 12 inches in the least dimension.
    - (2) 50° F for sections 12 to 36 inches in the least dimension.
    - (3) 45° F for sections 36 to 72 inches in the least dimension.
    - (4) 40° F for sections greater than 72 inches in the least dimension.
  - c. The minimum requirements may be terminated when temperatures above 50° F occur during more than half of any 24-hour duration. The temperature of concrete at time of placement shall not exceed 90° F.

4. Compressive Strength Tests: Conform to ACI 214 tests for compressive strength. Strength tests of concrete will be performed during construction in accordance with the following procedures:
  - a. Six 6-inch by 12-inch cylinders will be molded and cured from each sample taken in accordance with ASTM C31/C31M. Evaporation and loss of water from the specimen shall be prevented.
  - b. Cylinders will be tested in accordance with ASTM C39. One cylinder will be tested at 3 days, two cylinders at 7 days, two cylinders at 28 days, and one cylinder held in reserve. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding or testing, the specimen will be discarded and the strength of the remaining cylinder considered as the test result. If both specimens in a test show defects, the Commissioner may allow the entire test to be discarded.
  - c. If the average of any three consecutive strength test results is less than the specified strength ( $f_c$ ) or the minimum test strength ( $f_{cr}$ ) for durability, whichever is higher, by more than 500 psi, a minimum of three core samples will be obtained in accordance with ASTM C42 from the in-place work represented by the low test results. Locations represented by erratic core strengths will be retested and the Contractor will be charged for the cost of the retesting.
  - d. Upon review by the Commissioner and as directed by the Commissioner, the Contractor shall remove concrete not meeting specified strength criteria and provide new acceptable concrete. Repair core holes with non-shrink grout. Match color and finish of adjacent concrete.
  - e. Strength test reports shall include location in the work where the batch represented by a test was deposited, batch ticket number, time batched and sampled, slump, air content (where specified), mixture and ambient temperature, unit weight, and water added on the job. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing.
5. Air Content: Conform to ASTM C173 or ASTM C231 for normal weight concrete. Air content tests will be conducted on samples from the first three batches in the placement and until three consecutive batches have air contents within the range of the specified air content, at which time the procedure will be changed to test every fifth batch. This test frequency will be maintained until a batch is not within the specified range at which time testing of each batch will be resumed until three consecutive batches have air contents within the specified range. Additional tests will be performed as necessary for

control. Air content tests will be taken from planned composite samples or from samples taken in accordance with ASTM C172 at the point of concrete placement.

- E. Non-Destructive Tests: Use of the rebound hammer in accordance with ASTM C805, ASTM C597, or other non-destructive processes may be permitted by the Commissioner in evaluating the uniformity and relative concrete strength in place, or for selecting areas to be cored. Test results conducted on properly calibrated equipment will be evaluated and validated by the Commissioner in accordance with standard ASTM procedures indicated.
- F. Core Tests: Cores will be obtained and tested in accordance with ASTM C42. If concrete in the structure is dry under service conditions, cores (temperature 60° to 80° F, relative humidity less than 60 percent) will be air dried for 7 days before testing and tested dry. If concrete in the structure will be more than superficially wet under service conditions, the cores will be tested, after moisture conditioning, in accordance with ASTM C42. At least three representative cores will be tested from each member or area of concrete in place that is considered potentially deficient. The strength of the structure shall be impaired as little as possible. If, before testing, cores show evidence of having been damaged subsequent to or during removal from the structure, replacement cores will be ordered. Fill core holes with low slump concrete or mortar of a strength equal to or greater than the original concrete. The Commissioner will evaluate and validate core tests in accordance with the specified procedures. Before testing in compression, each core will be tested to determine pulse velocity through concrete in accordance with ASTM C597. Correlate pulse velocity of concrete cores with pulse velocity of in-place concrete.
- G. Acceptance of Concrete Strength
1. Standard Molded and Cured Strength Specimens: Concrete strength will be considered acceptable when the averages of all sets of three consecutive compressive strength test results equal or exceed the design compressive strength ( $f'_c$ ) or the required field test strength ( $f_{cr}$ ), whichever is higher, and no individual strength test falls below the specified compressive strength ( $f'_c$ ) or the required field durability strength ( $f_{cr}$ ) by more than 500 psi, whichever is higher. These criteria also apply when accelerated strength testing is specified unless another basis for acceptance is specified.
  2. Non-Destructive Tests: Non-destructive tests may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria.
  3. Core Tests: When the average compressive strengths of the representative cores are equal to at least 85 percent of the design strength ( $f'_c$ ) or the required average test strength ( $f_{cr}$ ), whichever is higher, and if no single core is less than 75 percent of the specified strength ( $f'_c$ ) or the required average field test



strength ( $f_{cr}$ ), whichever is higher, the concrete strength will be considered acceptable.

- H. Verification of Miscellaneous Items to be Surveyed: The Contractor's Surveyor shall take optical survey measurements to certify the location of all conduit sleeves, concrete openings and anchor bolts for future work.

### 3.14 REMEDIAL WORK

- A. Repair or replace deficient concrete work as directed by the Commissioner and at no additional cost to the City of New York.
- B. Formed concrete repairs shall conform to those described in Section 03350 – Concrete Finishes and as specified herein. Repair defective formed surfaces by removing minor honeycombs, pits greater than one square inch in surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with non-shrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycombing including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate or other defects that affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise indicated.
- C. Defects shall be defined by the more stringent of ACI 301 requirements for "Architectural Concrete" or the following:
1. Pockets of honeycomb (uncemented coarse aggregate) more than one-inch deep and 100 square inches in area are found.
  2. Sand streaks (pockets or streaks of uncemented fine aggregate more than one inch deep and 100 square inches in area) are found.
  3. Corners of forms are not filled.
  4. Bottom of concrete is not down to indicated levels or shows uncemented material at the bottom.
  5. Members are undersized.
  6. Concrete fails to "set-up" (indents under a hammer blow, after 7 days).
- D. Patch defective concrete surfaces with a suitable, approved patching material, mix or product as directed by the Commissioner.

-END OF SECTION-

**Section 03350**  
**CONCRETE FINISHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all materials, labor, and equipment required to provide finishes of all concrete surfaces, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. This section includes, but is not limited to, the following items:
  - 1. Concrete Floor Sealer
  - 2. Heavy Duty Shake-on Aggregate Hardener
  - 3. Finishes on Formed Concrete Surfaces
  - 4. Slab and Floor Finishes

**1.02 RELATED SPECIFICATIONS**

- A. Section 03100 - Concrete Forms and Accessories
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 07140 - Fluid-Applied Waterproofing
- D. Section 07141 - Surface Applied Interior Waterproofing
- E. Section 09010 - Room Finish Schedule

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced unless otherwise noted. The publications are referred to in the text by the basic designation only.
  - 1. American Concrete Institute (ACI)
    - a. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials
    - b. ACI 301, Specifications for Structural Concrete for Buildings
    - c. ACI 302.1, Guide for Concrete Floor and Slab Construction
  - 2. American Society for Testing and Materials (ASTM)
    - a. ASTM E1155, Standard Test Method for Determining  $F_F$  Floor Flatness and  $F_L$  Floor Levelness Numbers

## b. City of New York

- (1) New York City Building Code, Local Law 76/1968, latest edition and amendments or supplements thereto
- (2) York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto

## 1.04 PERFORMANCE REQUIREMENTS

## A. Field Sample Panel for Cast-in-Place Formed Concrete Finish

1. Produce, on the project site where directed by the Commissioner, an L-shaped sample panel of a cast-in-place concrete wall or panel that is a minimum of 4 feet high, 4 feet from the corner on two sides, 6 inches thick to demonstrate the expected range of finish, color and texture of architectural concrete finishes. Concrete shall conform to the applicable material and workmanship requirements of Section 03300 – Cast-in-Place Concrete for Class 45 concrete.
2. Reinforce the wall or panel with #4 bars at 12” on center each way on each face with 1-1/2” concrete cover unless otherwise shown in the Contract Drawings. Use form ties that are the same as those approved and with the form tie pattern similar to that approved in accordance with Section 03100 – Concrete Forms and Accessories. Use one face of the wall or panel for smooth architectural concrete including “reveal” rustication with form joints, and the opposite face for form liner concrete. Demonstrate methods of curing, aggregate exposure, sealers and coatings as directed by the Commissioner.
3. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. Remove and replace tie hole plugging mortar as necessary until an acceptable color match is obtained.
4. After the sample panels have been approved, intentionally damage an exposed surface for each finish in the presence of the Commissioner. Demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces. Patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.
5. Leave the approved mock-up on the job during construction to serve as the standard of workmanship for the project. Remove the mock-up from the premises after completion of the work or as directed by the Commissioner.

**B. Field Sample Panels for Concrete Floor Finish**

1. Construct a floor finish sample panel at the project site for each type of concrete floor finish specified herein and as directed by the Commissioner. Construct each sample panel to be a minimum size of one foot square by 2-inches thick except as otherwise specified herein. Concrete shall conform to the applicable material and workmanship requirements of Section 03300 – Cast-in-Place Concrete for Class 45 concrete.
2. Construct a minimum 10-foot square by 6-inches thick field sample of a concrete floor slab with the non-metallic surface hardener in order to become familiar with the approved product characteristics and application procedures.
3. The sample panels shall be subject to review and approval by the Commissioner. The approved floor finish sample mock-ups shall remain at the City of New York's field trailer throughout the duration for which concrete floor finish work is performed. The sample panels will be used as a basis for the approval of the in-place concrete floor finishes. Remove the sample panels from the premises after completion of the work or as directed by the Commissioner.

**1.05 SUBMITTALS****A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:**

1. Product Data: Manufacturer's descriptive product data, current specifications, test results and installation instructions for materials proposed for the work of this Section.
2. Material certifications and technical data sheets.
3. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each product proposed for use.
4. Schedule of floor finishes by room/area designation.
5. Certifications that the applicator of the concrete sealer and the shake-on aggregate surface hardener each has a minimum of three (3) years of documented experience in installation of their respective product and is acceptable to the product manufacturer.
6. Technical service report for each site visit made by manufacturer's technical representative during placement of floor surface hardener. Report content shall conform to Paragraph 1.06.C.3.

## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Floor Surface Hardener: Engage the services of the manufacturer's field service representative to supervise the application of the floor surface hardener and to perform the following technical services:
  - 1. Conduct a pre-construction conference a minimum of seven calendar days prior to initial concrete placement with the Commissioner, the Contractor's superintendent and concrete finisher foreman, who is actually performing the concrete placement and finishing work, to define critical times and procedures to be used in placement of floor surface hardener. Construct the field sample floor panel described above as part of the pre-job conference.
  - 2. Witness the initial placement of concrete and floor surface hardener and make a minimum of three subsequent site visits to ensure correct placement of the floor surface hardener. Apply the hardener using a controlled method approved by the Commissioner. Make additional site visits (in excess of the three specified) to address field problems as requested by the Commissioner at no additional cost to the City of New York.
  - 3. Submit a technical service report for each site visit made during placement of floor surface hardener. Each report shall include, as a minimum, the following information:
    - a. Time of concrete placement
    - b. Time of hardener placement
    - c. Quantity of hardener applied per square foot
    - d. Location of observed placement from placement schedule
    - e. Condition of bleed water on concrete at time of hardener placement
    - f. Types of floating and troweling used
    - g. Curing method used
    - h. Names of project, concrete supplier, Contractor and job supervisor
  - 4. Submit the technical service report in triplicate within seven calendar days after concrete placement with copies distributed to the Commissioner (two) and the Contractor.

- D. Concrete Floor Finishes: Conform to the designated finish type specified in the Concrete Finish Schedule unless otherwise indicated in Section 09010 – Room Finish Schedule for a particular room or area. Conform to the applicable provisions of ACI 302.1 - Guide for Concrete Floor and Slab Construction unless more stringent requirements are specified herein.
- E. Floor and Slab Finish Tolerances
  - 1. Floor and slab finishes shall meet the minimum F-number flatness tolerance specified herein for each finish type in accordance with the provisions of ACI 117.
  - 2. The Commissioner will conduct floor flatness tests of finished floor surfaces in accordance with the provisions of ASTM E1155. Floor flatness tolerance measurements will be taken by the Commissioner within 24 hours after completion of final troweling operation and before forms and shores are removed. Results of floor tolerance tests, including notification of acceptance or rejection, will be reported to the Contractor within 24 hours following data collection.
  - 3. Floor sections, defined as 100 square feet minimum of floor area, measuring at or above the minimum F-number will be accepted for tolerance compliance as constructed. Slabs-on-grade measuring below the specified minimum F-number shall be removed and replaced or ground as required and as directed by the Commissioner. Sections of elevated slabs measuring below the specified minimum F-number shall be ground as required and/or re-topped using an approved structural report mortar at the direction of the Commissioner. No remedies for sub-minimum F-number other than replacement of slabs-on-grade, or grinding and/or re-topping of elevated slabs will be permitted.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Failure to comply with the following shall be sufficient cause for rejection of materials by the City of New York and requiring their removal from the site. Supply new material at no additional expense to the City of New York.
- B. Delivery of Materials
  - 1. Deliver materials in manufacturer's original unopened and undamaged containers, with information accurately representing container contents as approved by the Commissioner at time of Shop Drawing submission.
  - 2. Include the following information on the label:
    - a. Name of material and supplier.
    - b. Installation, handling and protection requirements.

3. Deliver materials in sufficient quantities to allow uninterrupted continuity of the work.

C. Storage of Materials

1. Store only approved materials at the project site.
2. Store materials in original, undamaged containers with manufacturer's labels and seals intact.
3. Store all materials in a dry, enclosed area, off the ground and away from all possible contact with water, out of direct sunlight, and in a location where temperature can be constantly maintained between 60 degrees F and 75 degrees F.
4. Prevent damage to materials during storage primarily by minimizing the amount of time they are stored at the job site before being incorporated into the work.

1.08 PROJECT CONDITIONS

- A. General: Examine the areas and conditions under which the applied floor finish is to be installed and notify the Commissioner promptly in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until disputed conditions, discrepancies and/or damages have been corrected, unless otherwise directed by the Commissioner.
- B. Confirm applicability of designated floor finish indicated on Concrete Finish Schedule with manufacturers of approved concrete floor sealer and shake-on aggregate floor hardener prior to placing concrete. Modify concrete finish as necessary to conform to manufacturer's recommendations and obtain Commissioner's approval prior to placing concrete.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR SEALER

- A. Concrete floor sealer: Provide a high performance, high-gloss, low-viscosity, VOC-compliant, one or two component, moisture-cured, polyurethane concrete floor sealer and dustproofing agent suitable for industrial and commercial applications. Product shall be designed to penetrate into cured concrete floor surfaces to provide a moisture-resistant barrier resistant to abrasion, impact, chemical attack and dusting. Add clean silica sand to the material to achieve a slip-resistant finish where required in accordance with the manufacturer's recommendation. Provide approved concrete floor sealer at concrete floor surfaces where indicated in Section 09010 and as specified herein.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Euco Diamond Hard Sealer, Euclid Chemical Company, Cleveland, OH
2. Sealhard, L&M Construction Chemicals, Inc., Omaha, NE, BASF Construction Chemicals - Building Systems, Shakopee, MN
3. Day-Chem Sure Hard, Dayton Superior, Dayton, OH
4. Or approved equal

## 2.02 HEAVY DUTY SHAKE-ON AGGREGATE HARDENER

A. Heavy Duty Abrasive Shake-on Hardener: Provide an abrasive, non-slip, non-metallic, dry shake, ready-to-use surface treatment for heavy duty wear and exposure consisting of a specially graded, natural mineral aggregate manufactured from aluminum oxide (Corundum). Apply to the exposed surfaces of the concrete topping slabs at the tipping and loader floors at a rate of 1.5 lbs. per sq. ft. in strict accordance with the manufacturer's instructions.

B. Products: Subject to compliance with requirements, provide one of the following:

1. A-H Emery, Anti-Hydro International, Inc., Flemington, NJ
2. Emeryplate FF, L&M Construction Chemicals, Inc., Omaha, NE
3. Surflex Non-metallic Floor Hardener, Euclid Chemical Company, Cleveland, OH
4. Or approved equal

## PART 3 EXECUTION

### 3.01 FINISHES ON FORMED CONCRETE SURFACES

A. Construct formed structural concrete in conformance with Section 03300 – Cast-in-Place Concrete. After removal of forms, apply the finishes described below in accordance with the Concrete Finish Schedule presented herein. All formed surfaces shall receive at least a Type I finish unless specified or indicated otherwise. The Commissioner shall be the sole judge of applicability and acceptability of all formed concrete finish work.

1. Type I - Rough or Board Form Finish: Remove all fins, burrs and other projections left by formwork removal in accordance with the provisions of Section 03100 - Concrete Forms and Accessories. Fill solid all holes left by removal of ties, and all other holes, depressions, or voids with cement grout after first being thoroughly wetted. Chip back honeycombs to solid concrete,



as directed by the Commissioner, prior to patching with cement grout. Fill holes with a small tool that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall closely match the adjacent wall surface. Thoroughly clean the surface of all stains or discolorations that will interfere or be incongruous with the final finish.

2. Type II - Smooth Form Finish: Concrete shall be cast against forms constructed of plywood not less than 5/8-inch thick, or of boards lined with tempered hardboard not less than 3/16-inch thick, or other approved materials in accordance with the provisions of Section 03100 - Concrete Forms and Accessories and as specified herein. Do not use form material that has raised grain, torn surfaces, worn edges, dents, patches of holes from previous use, other defects that would impair the texture, appearance or durability of the concrete surface, or that is not acceptable to the Commissioner. Utilize form material sheets as large as practicable in an orderly and symmetrical configuration and keep seams to a practical minimum. Other aspects of the finish shall conform to the requirements of Type I finish.
3. Type III - Grout Cleaned Finish: Where this finish is required, it shall be applied after completion of Type II finish. After the formwork is removed and the concrete has been pre-dampened, mix and spread a slurry consisting of one part cement to 1-1/2 parts sand passing the No. 30 sieve, by damp loose volume, over the surface with clean burlap pads or sponge rubber floats and scrubbed into the surface using a rotary motion. Include an appropriate quantity of white cement in the slurry mixture to produce a color closely matching the surrounding concrete. Remove any surplus material by scraping and then rubbing with clean burlap. Keep the finish damp for at least 36 hours after application.
4. Type IV - Smooth Rubbed Finish: Where this finish is required, it shall be applied after the completion of the Type II finish, and no later than one day following form removal. Do not commence rubbing before the concrete is thoroughly hardened and the mortar used for patching is firmly set. Obtain a smooth, uniform surface by wetting the concrete surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, avoid cutting into the general surface of the concrete. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted.
5. Type V - Textured Finish: Use textured forms or textured form liners of plastic, wood, or sheet metal in accordance with Section 03100 - Concrete Forms and Accessories, as specified herein and which are acceptable to the Commissioner. Secure liner panels in forms by cementing or stapling, but not by methods which will permit impressions of nail heads, screw heads,

washers, or the like to be imparted to the surface of the concrete. Seal edges of textured panels to each other or to divider strips to prevent bleeding of cement paste. Use a sealant that will not stain the concrete surface.

6. Type VI - Exposed Aggregate Finish: Provide an exposed concrete surface that will duplicate a mock-up or sample panel prepared in advance and accepted by the Commissioner. Expose aggregate in the concrete surface using one of the following methods:
  - a. For a scrubbed finish, cast concrete against form faces that have been coated with a chemical retarder used in accordance with the manufacturer's recommendations. Wet the partially hardened concrete surface thoroughly and scrub with fiber or wire brushes, using water freely until the surface mortar is removed and the aggregate is uniformly exposed. Then rinse the surface with clear water. If portions of the surface have become too hard to permit uniform aggregate exposure, use dilute hydrochloric acid (one part commercial muriatic acid diluted with 4 to 10 parts water) to remove the excess surface mortar after the concrete is at least 2 weeks old. Remove the acid from the finished surface with clean water within 15 minutes after application.
  - b. For a blast finish, sandblast or waterblast the concrete surface to a degree sufficient to expose fine aggregates with occasional exposure of coarse aggregate, and to produce a uniform color with a maximum reveal of 1/16-inch unless specified otherwise in the Contract Documents. All surfaces with the same specified blast finish shall be prepared at approximately the same time after concrete placement. Use stainless steel or plastic reinforcement supports and spacers near concrete surfaces to be blasted. Protect adjacent materials and inserts during blasting operations.
  - c. For a tooled finish, dress the thoroughly cured concrete surface with electric, air, or hand tools to a uniform texture removing surface mortar where specified in the Contract Documents. Then provide the surface with a hand tooled, rough or fine pointed, crandalled, or bush-hammered surface texture, as specified by the Contract Documents.
7. Type VII - Applied Finish: When finishes of stucco, cementitious coatings, or similar troweled materials are required or permitted, prepare the surface of the concrete to ensure permanent adhesion of the finish. If the concrete is less than 24 hours old, roughen it with a heavy wire brush or scoring tool. If the concrete is more than 24 hours old, roughen the surface mechanically or by acid etching. After roughening, wash the surface free of all dust, acid, chemical retarder, and other foreign material before any final finish is applied.

## 3.02 SLAB AND FLOOR FINISHES

- A. General: The concrete finishes described below shall be applied to floors, slabs, overlays, toppings, and tops of formed walls in accordance with ACI 301, the Concrete Finish Schedule presented herein and the applicable portions of the Room Finish Schedule presented in Section 09010 – Room Finish Schedule. The Commissioner will test for finish flatness of finished floor surfaces within 24 hours of final troweling in accordance with the F-Number System of ACI 117. The Commissioner will review and approve the applicability of the required concrete finish for a given area. The Commissioner shall be the sole judge of acceptability of all such concrete finish work.
1. Type "A" – Screeded Finish: Place, consolidate by placing screeds at frequent intervals, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleed water appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleed water is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleed water. Produce a finish that will meet a minimum overall flatness tolerance of  $F_F15$  conventional bullfloated finish in accordance with ACI 117.
  2. Type "B" – Scratched Finish: Following completion of Type "A" finish, do not work concrete further until water sheen has disappeared and surface has stiffened slightly. Then roughen the surface with stiff brushes or rakes before final set.
  3. Type "C" – Floated Finish: Following completion of Type "A" finish, do not work the concrete further until the surface is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, a powered disc float highway straightedge as soon as the water sheen had disappeared and the surface has stiffened sufficiently to permit the operation. During or after the first floating, check flatness of surface with a 10-foot straightedge applied in two or more directions. Eliminate high spots and low spots during this procedure to produce a conventional, straightedge finish, then refloat the slab immediately to a uniform sandy texture. Repeat as necessary to produce a minimum overall flatness tolerance of  $F_F20$  conventional straightedged finish in accordance with ACI 117.
  4. Type "D" - Hard Steel Troweled Finish: Following completion of a Type "C" finish and sufficient hardening of the concrete to prevent excess fine material from working to the surface, compact and smooth the surface with a power trowel. Following the power trowel, hand trowel to provide a smooth, dense surface, free from defects, trowel marks, and blemishes. For surfaces exposed to wear, continue hand troweling until a ringing sound is produced as the floor is troweled to provide a hard steel trowel finish. For surfaces to receive a surface applied waterproofing system in accordance with Section 07140 -

Fluid-Applied Waterproofing or Section 07141 - Surface Applied Interior Waterproofing, provide water cure and light steel trowel finish followed by a fine hair broom texture.

5. Type "E" - Magnesium Troweled Finish: Following completion of a Type "C" finish and sufficient hardening of the concrete to prevent excess fine material from working to the surface, compact and smooth the surface with a power trowel. Following the power trowel, hand trowel to provide a smooth, dense surface, free from defects and blemishes. For surfaces requiring a non-slip finish, continue hand troweling with a magnesium surface trowel to produce a slightly swirled pattern.
6. Type "F" - Broom Finish: This finish shall provide the surface with a transverse scored texture by drawing a broom across the surface immediately after completion of a Type "C" finish. Apply transverse broom finish perpendicular to direction of travel. Amplitude of broom finish shall be approximately 1/8", with the exception of the concrete overlay surface for the exterior ramp deck slab which shall have minimum amplitude of broom finish of 1/4 inch but not more than 1/2 inch.
7. Type "G" - Concrete Floor Sealer: Following completion of a Type "E" finish and after the floor slab has been allowed to cure for a sufficient length of time, in accordance with the written instructions of the sealer manufacturer, remove all dirt, droppage, oil, grease, asphalt or other foreign matter with caustics and detergents as required prior to application. Apply approved concrete floor sealer in strict accordance with the manufacturer's instructions.
8. Type "H" - Heavy Duty Abrasive Shake-on Hardened Finish: Provide broadcast-applied hardener finish by applying a specially graded, non-metallic, natural mineral aggregate concurrently with the application of a hard burnished, power troweled, Type "D" hard steel trowel. Apply hardener in strict accordance with the manufacturer's instructions.

### 3.03 PLACEMENT OF CONCRETE TOPPINGS AND OVERLAYS

- A. Conform to the provisions of ACI 301 for placement of concrete toppings and overlays. Apply the following requirements to the placement of concrete toppings on concrete surfaces that are either freshly placed or still plastic, or on hardened concrete slabs.
  1. Placing on Fresh Concrete: Screed and bull float the base slab. As soon as water sheen has disappeared, lightly rake surface of the base slab with a stiff bristle broom to produce a bonding surface for the topping. Immediately spread topping mixture evenly over the roughened base before final set takes place. Place the topping and finish as specified.

2. **Bonding to Hardened Concrete:** When the topping is to be bonded to a roughened hardened base, remove dirt, laitance, and loose aggregate by means of a stiff wire broom. Keep the cleaned base wet for a period of 12 hours preceding the application of the topping. Remove excess water and apply a 1:1:1/2 cement-sand-water grout, and brush into the surface of the base slab. Do not allow the cement grout to dry, and spread it only short distances ahead of the topping placement. Do not allow the temperature differential between the completed base and the topping mixture to exceed 10 degrees F. at the time of placing. Place the topping and finish as specified.

### 3.04 FINISHES ON EQUIPMENT PADS

- A. Formed surfaces of equipment pads shall receive a Type II finish.
- B. Top surfaces of equipment pads, except those surfaces subsequently required to receive non-shrink grout and support equipment bases, shall receive a Type "D" finish, unless otherwise noted. Surfaces which will later receive non-shrink grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2-inch deep.

### 3.05 CONCRETE FINISH SCHEDULE

Item	Finish Type
Concrete surfaces not exposed to public view including utility spaces	I
Interior overhead surfaces exposed to view and interior push/shear walls	II
Surfaces to be painted	III
Exterior surfaces and interior vertical surfaces exposed to view	IV
Other architectural finishes	V, VI or VII as indicated in the Contract Documents
Surfaces to receive bonded cementitious mixtures, overlays or integral toppings	B
Surfaces to receive waterproofing membranes or rigid roofing insulation (see Sections 07140 and 07141)	D (see special requirements described above)
Floors to receive ceramic tile floor finish or receive resinous floor system, as indicated in Section 09010 - Room Finish Schedule	D
Exterior pier deck, sidewalks and exterior stairs	E
Wearing surface of integral concrete overlay of exterior vehicle ramps, and at driveways and apron slabs	F

Item	Finish Type
Floors for interior equipment and storage rooms, interior stairs, catwalks, vestibules, circulation galleries, maintenance area, and container loading area as indicated in Section 09010 - Room Finish Schedule	G
Wearing surface of non-integral concrete topping at vehicular traffic areas of tipping and loader floors	H

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 03410**  
**PRECAST STRUCTURAL CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install precast concrete ventilation shafts, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
  - 1. The work includes the providing precast, non-prestressed concrete members herein referred to as precast members.
  - 2. Precast members shall be the product of a manufacturer specializing in the production of precast concrete members.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 03200 - Concrete Reinforcement
- C. Section 03300 - Cast-in-Place Concrete

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Concrete Institute International (ACI)
    - a. ACI 304R, Measuring, Mixing, Transporting and Placing Concrete
    - b. ACI 305R, Hot Weather Concreting
    - c. ACI 306.1, Cold Weather Concreting
    - d. ACI 309R, Consolidation of Concrete
    - e. ACI 318/318M, Building Code Requirements for Structural Concrete.
  - 2. American Society for Testing and Materials (ASTM)
    - a. ASTM A82, Steel Wire, Plain, for Concrete Reinforcement
    - b. ASTM A185, Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
    - c. ASTM A497, Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement



- d. ASTM A615/A615M, Deformed and Plain Billet-Steel for Bars for Concrete Reinforcement
- e. ASTM C94, Ready-Mixed Concrete
- f. ASTM C1107, Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- 3. Precast/prestressed Concrete Institute (PCI)
  - a. PCI MNL-116, Quality Control for Plants and Production of Precast Prestressed Concrete Products
  - b. PCI MNL-120, Design Handbook - Precast and Prestressed Concrete.
- 4. City of New York:
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.

#### 1.04 SUBMITTALS

- A. Submit the following information in accordance with the General Conditions and Section 01330 - Shop Drawings.
  - 1. Shop Drawings: Drawings for precast members including details of member geometry and details of reinforcing and embedments. Submit drawings indicating complete information for the fabrication, handling, and erection of the precast member. Drawings shall not be reproductions of Contract Drawings. Design calculations and drawings of precast members (including connections) shall be prepared and signed by the Contractor's licensed Professional Engineer registered in the State of New York, and submitted for approval prior to fabrication. The Shop Drawings shall indicate, as a minimum, the following information:
    - a. Marking of members for erection
    - b. Connections for work of other trades
    - c. Connections between members, and connections between members and other construction
    - d. Location and size of openings which require the relocation of reinforcing steel to be cast in the member

- e. Joints between members, and joints between members and other construction
  - f. Reinforcing steel details
  - g. Material properties of steel and concrete used
  - h. Lifting and erection inserts
  - i. Dimensions and surface finishes of each member
  - j. Erection sequence and handling requirements
  - k. Handling loads used in design
  - l. Bracing/shoring required
  - m. Areas to receive toppings, topping thickness
2. Quality Control Submittals
- a. Design Data
    - (1) Precast member design calculations: Design calculations and drawings of precast members (including connections) shall be prepared and signed by a licensed Professional Engineer registered in the State of New York, and submitted for approval prior to fabrication.
    - (2) Concrete mix design data: Submit a mix design for each strength and type of concrete. Include a complete list of materials including type; brand; source and amount of cement, ground granulated blast furnace slag, and admixtures; and applicable reference specifications.
      - (a) Submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Obtain approval before concrete placement.
  - b. Test Reports: Submit test reports in accordance with Section 03300 - Cast-in-Place Concrete, Subsection 1.04.E.2.
  - c. Certificates
    - (1) Quality control procedures and other data as required in Section 03300 - Cast-in-Place Concrete.

- (2) Procedures: Submit quality control procedures established in accordance with PCI MNL-116.

3. Product Data / Source Quality Control Data

- a. Submit mandatory batch ticket information for each load of ready-mixed concrete in accordance with ASTM C94.

## 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the New York City Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.

- B. Testing and Inspection

1. Fabrication, placement and welding of reinforcing steel shall be subject to special inspection in the mill, shop and field in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.

2. Special Inspections

- a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
  - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.

- c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- C. PCI Quality Certifications: ACI 318/318M and the PCI MNL-120. Design precast members for handling without cracking in accordance with the PCI MNL-120.
  - 1. Product Quality Control: PCI MNL-116 for PCI enrolled plants. Where panels are manufactured by specialists in plants not currently enrolled in the PCI "Quality Control Program," provide a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory. Submit test results to the Commissioner.
- D. Fabrication, Sampling, and Testing: PCI MNL-116 and Section 03300 - Cast-in-Place Concrete, whichever has the more stringent requirement for each respective test.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support precast members at the lifting and supporting points indicated on the approved Shop Drawings. Store precast members off the ground. Separate stacked members by battens across the full width of each bearing point. Protect from weather, marring, damage, and overload.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements
  - 1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
  - 2. Take sufficient field measurements prior to preparation of Shop and Working Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.

3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 CONCRETE

- A. The concrete mix design shall meet the requirements of Section 03300 - Cast-in-Place Concrete.

### 2.02 MATERIALS

- A. Cement shall conform to the requirements of Section 03300 - Cast-in-Place Concrete.
  1. Fly Ash shall conform to the requirements of Section 03300 - Cast-in-Place Concrete.
  2. Ground Granulated Blast-Furnace Slag shall conform to the requirements of Section 03300 - Cast-in-Place Concrete.
- B. Water shall conform to the requirements of Section 03300 - Cast-in-Place Concrete.
- C. Aggregates shall conform to the requirements of Section 03300 - Cast-in-Place Concrete.
- D. Nonshrink Grout: ASTM C1107.
- E. Admixtures shall conform to the requirements of Section 03300 - Cast-in-Place Concrete, including calcium nitrate corrosion inhibitor.
- F. Reinforcement
  1. Reinforcing Bars shall conform to the requirements of Section 03200 - Concrete Reinforcement. Bars shall be uncoated unless otherwise noted on the Contract Drawings.
  2. Welded Wire Fabric: ASTM A185 or ASTM A497.

### 2.03 FABRICATION

- A. Conform to PCI MNL-116, unless specified otherwise.
- B. Forms: Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of columns and beams 3/4 inch, unless otherwise indicated. Provide keys for deck panels as detailed on the Contract Drawings.

- C. Reinforcement Placement: Conform to ACI 318/318M for placement and splicing. Reinforcement may be preassembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections.
- D. Concrete
  - 1. Concrete Mixing: ASTM C94. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.
  - 2. Concrete Placing: ACI 304R, ACI 305R for hot weather concreting, ACI 306.1 for cold weather concreting, and ACI 309R, unless otherwise specified.
  - 3. Concrete Curing: Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 50 and 185 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts.
- E. Surface Finish: Repairs to honeycombed sections located in a bearing area shall be approved by the Commissioner prior to repairs. Precast members that contain honeycombed sections deep enough to expose reinforcement will be rejected. Members that exhibit hairline cracks that are less than 0.01 inches in width may be accepted. Members that exhibit cracks greater than 0.01 inches in width, but not greater than 0.02 inches in width shall be accepted only if approved by the Commissioner, and shall be repaired in an approved manner. Any member that exhibits a crack in excess of 0.02 inches in width, or is otherwise structurally impaired, shall be rejected by the Commissioner.
  - 1. Unformed Surfaces: Provide a rake finish with 1/4" amplitude for surfaces to receive cast-in-place concrete. Provide a steel troweled finish for surfaces to remain exposed in the finished work.
  - 2. Formed Surfaces: PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes.
    - a. Unexposed Surfaces: Provide a standard grade surface finish.
    - b. Exposed Surfaces: Provide a finish Grade B surface finish.

### PART 3 EXECUTION

#### 3.01 SURFACE REPAIR

- A. Prior to erection, and again after installation, check members for damage, such as cracking, spalling, and honeycombing. As directed by the Commissioner, members

that do not meet the surface finish requirements specified herein shall be repaired, or removed and replaced with new members.

### 3.02 ERECTION

- A. Erect precast members after the concrete has attained the specified compressive strength, unless otherwise approved by the Engineer and the member manufacturer.
  - 1. Erect members in accordance with the approved Shop Drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8) shall apply for tolerances. Provide a 1:500 tolerance, if no tolerance is specified.
  - 2. Brace members unless design calculations submitted with the Shop Drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads.
  - 3. Place members level, plumb, and square within tolerances. Align member ends.

### 3.03 BEARING SURFACES

- A. Bearing surfaces shall be flat, free of irregularities, and properly sized.
  - 1. Correct bearing surface irregularities with non-shrink grout.
  - 2. Provide bearing pads where indicated or required.
  - 3. Place precast members at right angles to the bearing surface, unless indicated otherwise, and draw-up tight without forcing or distortion, with sides plumb.

### 3.04 WELDING

- A. Do not weld reinforcing steel. Protect the concrete and reinforcing from heat during welding of any adjacent structural steel components.

### 3.05 OPENINGS

- A. Where openings in members are required, the openings shall be formed into the members before casting and reinforcing steel shall be detailed to avoid interference with the opening. Holes or cuts requiring reinforcing steel to be cut, which are not indicated on the approved Shop Drawings, shall only be made with the approval of the Commissioner and the member manufacturer. Where approved, drill holes less than 12 inches in diameter with a diamond-tipped core drill.

3.06 GROUTING

- A. Clean and fill indicated keyways between precast members, and other indicated areas, solidly with non-shrink grout. Provide reinforcing where indicated. Remove excess grout before grout hardens.

-END OF SECTION-



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**Section 03450**  
**PLANT-PRECAST ARCHITECTURAL CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes the following:
1. Precast architectural concrete panel units, as indicated
  2. Precast concrete seat units
  3. Precast concrete paving strips

**1.02 RELATED SPECIFICATIONS**

- A. Section 01631 – Equivalent Materials and Equipment

**1.03 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated:
1. Dead Loads: As per design thickness requirements provided by precast concrete manufacturer.
  2. Wind Loads: Per Current New York City Building Code.
  3. Earthquake Loads: Per Current New York City Building Code.
  4. Design system and connections to maintain clearances at openings and to allow for construction tolerances, as follows:
    - a. Vertical and horizontal adjustment of 2 inch, unless otherwise indicated.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Design Mixes: For each concrete face and back-up mix.
- C. Shop Drawings: Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement.
1. Indicate separate face and backup mix locations and thicknesses.

2. Indicate locations and extent and treatment of dry joints if two-stage casting is proposed.
  3. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
  4. Indicate locations and details of anchorage devices to be embedded in other construction.
  5. Indicate locations and details of thin units and joint treatment.
  6. Indicate locations and details of facings, anchors, and treatment of joints.
  7. Indicate sizes and locations of conduit penetrations, service boxes, and other cast-in-place devices for the mounting of the exterior lighting fixtures and similar penetrations.
  8. Provide comprehensive engineering analysis signed and sealed by a New York State licensed professional engineer responsible for its preparation. Engineering shall include calculations demonstrating compliance with indicated requirements for panels, anchors and connections.
- D. Samples: For each type of finish indicated on exposed surfaces of precast architectural concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 inches.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
- H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Concrete materials
  2. Reinforcing materials and prestressing tendons
  3. Admixtures
  4. Bearing pads
  5. Water-absorption test reports

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer, with a minimum of 3 years of experience, who has completed precast architectural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast architectural concrete units similar to those indicated for this Project and with a record of successful in-service performance.
  - 1. Assumes responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified Professional Engineer.
  - 2. Professional Engineer Qualifications: A professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast architectural concrete that are similar to those indicated for this Project in material, design, and extent.
  - 3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1--Architectural Cladding and Load Bearing Units or in APA's Plant Certification Program for Production of Architectural Precast Concrete Products and is designated an APA-certified plant.
  - 4. Has sufficient production capacity to produce required units without delaying the Work.
  - 5. Is registered with and approved by authorities having jurisdiction.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
- E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

- F. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered. Refer to Section 01631 – Equivalent Materials and Equipment.
- G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- H. Mockups: Before installing precast architectural concrete units, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Commissioner.
  - 2. Notify Commissioner seven days in advance of dates and times when mockups will be constructed.
  - 3. Obtain Commissioner's approval of mockups before starting fabrication.
  - 4. In presence of Commissioner, damage part of an exposed face for each finish, color, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed.
  - 7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 01310 - Project Coordination.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Adequately wrap, pack and protect precast architectural concrete fabrications with water-resistant, breathable coverings, hard non-absorbent fiber/wood containers/pallets and other protectives to ensure assemblies will be free of damages upon delivery to the job site.
  - 1. Support units during shipment on nonstaining shock-absorbing material.

- B. Deliver precast architectural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
- C. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

#### 1.07 SEQUENCING

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

### PART 2 PRODUCTS

#### 2.01 MOLD MATERIALS

- A. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated.

#### 2.02 REINFORCING MATERIALS

- A. Epoxy-Coated Reinforcing Bars: ASTM A 775, as follows:
  - 1. Steel Reinforcement: ASTM A 615, Grade 60, deformed
- B. Epoxy-Coated-Steel Wire: ASTM A 884, Class A coated, plain
- C. Epoxy-Coated-Steel Welded Wire Fabric: ASTM A 884, Class A coated, plain
- D. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 117, and as follows:
  - 1. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
- E. Epoxy Repair Coating: Provide a field applied, VOC compliant, epoxy corrosive resistant coating either identical to, or compatible with shop applied epoxy coatings. Coatings which are not identical to those shop applied must meet, or exceed the minimum performance of the shop applied materials.

## 2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, white, of same type, brand, and source.
  - 1. Standard gray portland cement may be used for nonexposed backup concrete.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.
  - 1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining.
    - a. Gradation: Uniformly graded
  - 2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Commissioner.
- C. Lightweight Aggregates: ASTM C 330
- D. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A
- H. Retarding Admixture: ASTM C 494, Type B
- I. Water-Reducing and Retarding Admixture: ASTM C 494, Type D
- J. High-Range, Water-Reducing Admixture: ASTM C 494, Type F
- K. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G
- L. Plasticizing Admixture: ASTM C 1017
- M. Fly Ash Admixture: ASTM C 618, Class C or F
- N. Metakaolin Admixture: ASTM C 618, Class N
- O. Silica Fume Admixture: ASTM C 1240

**2.04 STEEL CONNECTION MATERIALS**

- A. Welding Electrodes: Comply with AWS standards.
- B. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast architectural concrete units.

**2.05 STAINLESS-STEEL CONNECTION MATERIALS**

- A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers.
- C. Stainless-Steel Headed Studs: ASTM A 276.

**2.06 BEARING PADS**

- A. Provide bearing pads for precast architectural concrete units as follows:
  - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.
  - 2. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
  - 3. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

**2.07 WEEP TUBES**

- A. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
- B. Available Products: Provide one of the following:
  - 1. Heckmann Building Products Inc.; No. 85 Cell Vent
  - 2. Hohmann & Barnard, Inc.; Quadro-Vent
  - 3. Wire-Bond; Cell Vent
  - 4. or approved equal

**2.08 GROUT MATERIALS**

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.



- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.

## 2.09 CONCRETE MIXES

- A. Prepare design mixes for each type of concrete required.
  - 1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of portland cement by weight.
- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast architectural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.
- D. Normal-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 5000 psi. (minimum)
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.
- F. Lightweight Concrete Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 5000 psi. (minimum)
  - 2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft., plus or minus 3 lb/cu. ft., according to ASTM C 567
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- H. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

## 2.10 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing operations.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concreting. Coat form liner with non-staining form-release agent.
- B. Maintain molds to provide completed precast architectural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
  1. Edge, Reveal and Corner Treatment: Uniformly chamfered.

## 2.11 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
- B. Furnish loose stainless steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
- D. Cast-in openings larger than 10 inches in any dimension.
- E. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.
  1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
  2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
  3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
  4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
  5. Touch-up cut ends of reinforcement, and otherwise abraded/damaged epoxy coatings of re-bars and other such reinforcements with the epoxy repair coating specified herein.

- F. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.
- G. Prestress tendons for precast architectural concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 117. Delay detensioning or posttensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete.
- H. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.
- I. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.
- J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.
  - 1. Place backup concrete to ensure bond with face mix concrete.
- K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.
- L. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- M. Comply with ACI 305R recommendations for hot-weather concrete placement.
- N. Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.
- O. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- P. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Commissioner.

## 2.12 FABRICATION TOLERANCES

- A. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

- B. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:
1. Overall Height and Width of Units, Measured at the Face Exposed to View:  
As follows:
    - a. 10 feet or under, plus or minus 1/8 inch
    - b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch
    - c. 20 to 40 feet, plus or minus 1/4 inch
    - d. Each additional 10 feet, plus or minus 1/16 inch
  2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
    - a. 10 feet or under, plus or minus 1/4 inch
    - b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch
    - c. 20 to 40 feet, plus or minus 3/8 inch
    - d. Each additional 10 feet, plus or minus 1/8 inch
  3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch
  4. Rib Thickness: Plus or minus 1/8 inch
  5. Rib to Edge of Flange: Plus or minus 1/8 inch
  6. Distance between Ribs: Plus or minus 1/8 inch
  7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or 1/2 inch total, whichever is greater
  8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch
  9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch
  10. Dimensions of Haunches: Plus or minus 1/4 inch
  11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch
  12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch
  13. Bowing: Plus or minus L/360, maximum 1 inch
  14. Local Smoothness: 1/4 inch per 10 feet

15. Variation between Adjacent Thin-Brick-Facing Products: 1/16 inch
  16. Warping: 1/16 inch per 12 inches of distance from the nearest adjacent corner
  17. Tipping and Flushness of Plates: Plus or minus 1/4 inch
  18. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch
- C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.
1. Weld Plates: Plus or minus 1 inch
  2. Inserts: Plus or minus 1/2 inch
  3. Handling Devices: Plus or minus 3 inches
  4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch
  5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions
  6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal
  7. Location of Rustication Joints: Plus or minus 1/8 inch
  8. Location of Opening within Panel: Plus or minus 1/4 inch
  9. Flashing Reglets: Plus or minus 1/4 inch
  10. Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch
  11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch
  12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch
  13. Haunches: Plus or minus 1/4 inch
  14. Allowable Rotation of Plate, Channel Inserts, Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of the unit

## 2.13 FINISHES

- A. Finish exposed-face surfaces of precast architectural concrete units to match approved sample panels and mockups and as follows:

1. Color and Texture: Provide No. 291-SB-L per PCI "Architectural Precast Concrete Color and Texture Selection Guide, 2<sup>nd</sup> Edition.
  2. Light Sand Blasted Finish: Use fine grained aggregates, air-blast equipment, protected application techniques and cleaning procedures to expose aggregate and surrounding surfaces.
- B. Finish exposed surfaces of precast architectural concrete units to match face-surface finish.

#### 2.14 SOURCE QUALITY CONTROL

- A. City will employ an independent testing agency to evaluate precast architectural concrete fabricator's quality-control and testing methods.
1. Allow The City of New York's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with The City of New York's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.
- C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements.
- D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, City will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Commissioner.
  2. Cores will be tested in an air-dry condition.
  3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
  4. Test results will be made in writing on the same day that tests are performed, with copies to Commissioner, Contractor, and precast concrete fabricator. Test reports will include the following:
    - a. Project identification name and number
    - b. Date when tests were performed

- c. Name of precast concrete fabricator
  - d. Name of concrete testing agency
  - e. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed
- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Defective Work: Precast architectural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Do not install precast concrete units until supporting concrete has attained minimum design compressive strength.

#### 3.02 INSTALLATION

- A. Install clips, hangers, and other accessories required for connecting precast architectural concrete units to supporting members and backup materials.
- B. Install precast architectural concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
  - 1. Install bearing pads and plastic weep tubes as precast concrete units are being erected. Weep assemblies shall be installed at vertical joints of panel-to-panel conditions.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  - 3. Remove projecting hoisting devices and use sand-cement grout to fill voids within recessed hoisting devices flush with surface of concrete.

- C. Anchor precast architectural concrete units in position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.
- D. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
  - 1. Protect precast architectural concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
  - 2. Repair damaged steel surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces.
- E. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.
- F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

### 3.03 ERECTION TOLERANCES

- A. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.
- B. Install precast architectural concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances.
  - 1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch
  - 2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch
  - 3. Top Elevation from Nominal Top Elevation: As follows:
    - a. Exposed Individual Panel: Plus or minus 1/4 inch
    - b. Nonexposed Individual Panel: Plus or minus 1/2 inch
    - c. Exposed Panel Relative to Adjacent Panel: 1/4 inch
    - d. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch
  - 4. Support Elevation from Nominal Support Elevation: As follows:
    - a. Maximum Low: 1/2 inch
    - b. Maximum High: 1/4 inch



5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch
6. Plumb in Any 10 Feet of Element Height: 1/4 inch
7. Maximum Jog in Alignment of Matching Edges: 1/4 inch
8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch
9. Maximum Joint Taper: 3/8 inch
10. Joint Taper in 10 Feet: 1/4 inch
11. Maximum Jog in Alignment of Matching Faces: 1/4 inch
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch

#### 3.04 FIELD QUALITY CONTROL

- A. Testing: City will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Field welds and connections using high-strength bolts will be subject to tests and inspections.
- C. Testing agency will report test results promptly and in writing to Contractor and Commissioner.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

#### 3.05 REPAIRS

- A. Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Commissioner.
- B. Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

#### 3.06 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 03930**  
**CONCRETE RESTORATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work in this Section consists of furnishing all labor, materials, equipment, tools and other incidentals necessary to remove, repair and restore existing concrete surfaces as directed by the Commissioner, as specified herein and as required for a complete and proper restoration. Types of concrete repairs to be made include but are not limited to:
  - 1. Repair of surface spalls and delaminations in existing concrete
  - 2. Repair of existing cracks in existing concrete
- B. The concrete restoration work specified herein is applicable to existing structural concrete elements that are to remain and become incorporated in the final structures. The actual extent of the work shall be determined on the basis of field inspections conducted jointly by the Contractor and the Commissioner.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02222 - Demolition and Removals
- B. Section 03100 - Concrete Forms and Accessories
- C. Section 03200 - Concrete Reinforcement
- D. Section 03300 - Cast-in-Place Concrete
- E. Section 03350 - Concrete Finishes
- F. Section 05120 - Structural Steel

**1.03 MEASUREMENT AND PAYMENT**

- A. Measurement
  - 1. The Contractor shall perform all measurements for payment in the presence of the Commissioner.
  - 2. The Contractor shall prepare a listing of the types and locations of concrete repairs performed as described herein (e.g. shallow concrete spalls, deep concrete spalls, concrete cracks) including the units and actual quantities repaired under each repair category and present this list to the Commissioner for review and approval.
  - 3. The approved quantities of repair material actually incorporated in the work, delineated by the specified unit of measurement, will be the basis for payment.

4. Units of measurement for concrete repair work shall be as follows:

- a. Shallow Concrete Spall Repair (2" maximum depth) - square feet
- b. Deep Concrete Spall Repair (greater than 2" deep) - cubic feet
- c. Type A Concrete Crack Repair - linear feet
- d. Type B Concrete Crack Repair - linear feet
- e. Type C Concrete Crack Repair - linear feet

B. Payment

1. Payment for all work performed under this Section shall be determined by the agreed-upon quantities of concrete repairs actually incorporated in the work.
2. The basis for payment shall be the actual measured quantity of each repair type incorporated in the work, delineated by the specified unit of measure, multiplied by the corresponding contractual unit price shown on the Bid Form.
3. No separate payment will be made for surface sealing cracks and securing injection ports with epoxy resin compound prior to pressure injection of cracks. The costs thereof shall be included in the respective unit price bids for Types A and B concrete crack repairs.

1.04 REFERENCES

A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Concrete Institute (ACI)
  - a. ACI 308.1, Curing Concrete
  - b. ACI 546, Concrete Repair Guide
2. American Society for Testing and Materials (ASTM)
  - a. ASTM A82, Steel Wire, Plain, for Concrete Reinforcement
  - b. ASTM A185/A185M, Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
  - c. ASTM A276, Stainless Steel Bars and Shapes
  - d. ASTM C494/C494M, Chemical Admixtures for Concrete
  - e. ASTM C881, Epoxy-Resin Based Bonding Systems for Concrete

- f. ASTM C884, Thermal Compatibility of Concrete and an Epoxy-Resin Overlay
- 3. International Concrete Repair Institute (ICRI)
  - a. ICRI Technical Guideline No. 03730, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Corrosion
- 4. Society for Protective Coatings (SSPC); Steel Structures Painting Manual
  - a. SSPC - SP2, Hand Tool Cleaning
  - b. SSPC - SP3, Power Tool Cleaning
- 5. City of New York:
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings. Review of required submittals shall be by the Commissioner for acceptance unless specifically noted otherwise.
  - 1. Product Data: Manufacturer's descriptive product data, current specifications, test results and installation instructions for materials proposed for the work of this Section. Data shall substantiate that each product meets the requirements set forth in this Section.
  - 2. Sketches of repair sites indicating type of repair, location, dimensions and areas to be repaired.
  - 3. Certification from each product manufacturer's representative stating in writing that the manufacturer:
    - a. Is familiar with the project and aware on the job conditions.
    - b. Agrees with the intended application of the specified products.
    - c. Agrees to provide necessary supervision or direction to ensure the product's satisfactory application.

4. Certification that each product applicator has a minimum of three (3) years of documented experience in installation of concrete restoration materials. Submit references and project information to demonstrate the proposed installation contractor's experience on projects of comparable scope and complexity.

#### 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Manufacturer's Representative Services: Arrange for and provide the services of each product manufacturer's technical representative to supervise the initial application of each concrete repair material and perform the following technical services:
  1. Conduct a pre-installation conference with the manufacturer's representative, the Contractor, the Commissioner and the installation contractor performing the concrete repair work to provide detailed instructions and procedures to be used in the installation of the concrete repair materials, including surface preparation, mixing, application and curing.
  2. Witness the initial application of each repair material and make subsequent site visits, as needed or as requested by the Commissioner, to ensure that the repair materials are being installed properly and as intended.
  3. Submit a technical service report within seven days after the site visit to document the discussions, observations and recommendations made on site.
- C. Applicator Qualifications
  1. Utilize an installation contractor having a minimum of three (3) years of demonstrated experience in the installation of concrete restoration materials on projects of comparable scope and complexity.
  2. Provide at least one person who shall be present at all times during execution of the concrete restoration work and who is thoroughly familiar with the type of materials being used and the means and methods to install it.
- D. Follow the recommended practices outlined in ACI 546 and ICRI Technical Guideline No. 03730 with regard to surface preparation, placement and curing of concrete repair materials or the concrete repair procedures specified herein, whichever is more stringent.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Assume sole responsibility for properly receiving, handling and storing all materials furnished under this Section from the time that such materials are delivered to the site until final acceptance of the work by the City of New York.
- B. Maintain packaged materials in original containers with labels intact and with seals unbroken until time of use. All contained material shall have readable labels for the duration of the work.
- C. Store materials above ground in a dry place to avoid damage to material by water, freezing and the effects of weather.

## 1.08 PROJECT CONDITIONS

- A. Do not perform any repair work without prior approval of the Commissioner for location, limits and type of repair.
- B. Be advised that reinforcement may be encountered at repair locations.
- C. When using abrasive blasting, concrete sawing or chipping equipment, shield all work for the protection of the public and workers on the site.
- D. Some products specified may cause irritation to people through contact, inhalation of vapors, or ingestion, or may present other hazards.
- E. Safety precautions are solely the Contractor's responsibility. Take the necessary precautions to protect people from irritation and injury due to this work.
- F. Heed all label warnings by product manufacturers.
- G. Do not proceed with the installation of repair products under adverse weather conditions when defect to be repaired or sealed is frozen, or when temperatures are below or above the product manufacturer's recommended limitations for installation. Consult the product manufacturer for specific instructions before proceeding.
- H. Comply with all conditions of permits from the US Army Corp of Engineers and NY State Department of Environmental Conservation in executing the work.
  - 1. Prior to the start of each day's work provide means and measures to collect concrete chippings, repair mortar or concrete and prevent them from entering the waterway.
    - a. When working over land, provide drop cloths, tarps, plywood or similar devices laid atop the ground to collect removal debris or repair mortar and concrete droppings.



- b. When working over water, collect removal debris or repair mortar and concrete droppings on float stages secured to the structure. Provide fabric or other suitable device between float stages to prevent removal debris or repair mortar and concrete droppings from falling between the stages and entering the waterway. When working adjacent to sheet pile bulkheads equip float stages with "extensions" which fit into the valleys of the existing sheet piling.
  - c. Where use of float stages is not practical, collect removal debris or repair mortar and concrete droppings on a filter cloth or geotextile laid atop and secured to a chain or other type of wire-mesh laid on the waterway bottom or suspended from the structure which can be hauled out like a net. Suspend the outside edges of the filter cloth or geotextile from a floating boom around the work area to prevent chippings or repair mortar and concrete droppings from entering the waterway.
2. At the end of each day's work, haul out and remove all drop cloths, tarps, filter cloth/geotextile on chain/wire mesh and collect all debris. When working on a rising tide, adjust positioning of collection devices. Legally dispose of debris at a licensed offsite disposal facility.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. Shallow Concrete Spall Repairs (2" Maximum Depth)

1. Structural Repair Mortar: Use applicable structural repair mortar based on orientation of spalled surface for repair of spalled concrete surfaces up to two inches in depth.
  - a. Spalled concrete surfaces less than 1/4" in depth including minor surface imperfections and defects shall be considered superficial and shall not be repaired unless otherwise directed by the Commissioner.
2. Repair of Horizontal Top Surfaces:
  - a. Use a two-component, polymer-modified, portland cement, fast-setting, trowel-grade mortar specifically intended for repair of horizontal surfaces.
  - b. Products: Subject to compliance with requirements, provide one of the following:
    - (1) SikaTop 122 Plus; Sika Corporation, Lyndhurst, NJ
    - (2) Duraltop Fast Set; Euclid Chemical Co., Cleveland, OH

- (3) SD2 Repair Mortar; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
    - (4) Or approved equal
  - 3. Repair of Vertical and Overhead Surfaces
    - a. Use a two-component, polymer-modified, portland cement, fast-setting, non-sag mortar specifically intended for repairs of vertical and overhead surfaces.
    - b. Products: Subject to compliance with requirements, provide one of the following:
      - (1) SikaTop 123 Plus; Sika Corporation, Lyndhurst, NJ
      - (2) Duraltop Gel; Euclid Chemical Co., Cleveland, OH
      - (3) HB2 Repair Mortar; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
      - (4) Or approved equal
  - 4. Mechanical Expansion or Chemical Adhesive Anchors: Provide mechanical expansion or chemical adhesive anchors in accordance with the concrete repair details shown on the Contract Drawings and as specified in Section 05120 - Structural Steel.
  - 5. Cement Grout: Cement grout for patching concrete surfaces shall consist of one part cement to three parts sand, and the amount of mixing water shall be as little as consistent with the requirements of handling and placing.
- B. Deep Concrete Spall Repairs (Deeper than 2 inches)
  - 1. Concrete: Conform to the provisions of Section 03300 - Cast-in-Place Concrete except as follows:
    - a. Compressive strength: Class 45.
    - b. Coarse aggregate: Maximum 3/8" nominal washed stone (i.e., pea gravel).
    - c. Liquid membrane-forming curing compounds are not permitted.
  - 2. Welded Wire Fabric: ASTM A185/A185M. Provide uncoated welded wire fabric of the wire size and spacing shown on the concrete repairs details on the

Contract Drawings and as specified in Section 03200 – Concrete Reinforcement.

3. Steel Wire: ASTM A82, W4 or D4 minimum size.
4. Mechanical Expansion or Chemical Adhesive Anchors: Provide mechanical expansion or chemical adhesive anchors in accordance with the concrete repair details shown on the Contract Drawings and as specified in Section 05120 - Structural Steel.
5. Formwork: Provide formwork that conforms to the requirements of Section 03100 - Concrete Forms and Accessories.
6. Concrete Reinforcement: Provide new reinforcing bars of same size and spacing as existing reinforcement in accordance with the repair details shown on the Contract Drawings and as specified in Section 03200 - Concrete Reinforcement.
7. Anti-Corrosion Protective Coating: Provide a 3-component, water-based, epoxy-modified, cementitious, corrosion-resistant, VOC-compliant bonding agent suitable for bonding fresh mortar or concrete to exposed reinforcing steel surfaces.
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - (1) Armatec 110 EpoCem; Sika Corporation, Lyndhurst, NJ
    - (2) Corr-Bond; Euclid Chemical Company, Cleveland, OH
    - (3) Or approved equal.
8. Cement Grout: Cement grout for patching concrete surfaces shall be as specified in Paragraph 2.01A.5 above.

C. Structural Crack Repairs

1. Type A Concrete Crack Repair
  - a. General: Applicable to existing concrete surface cracks in walls and slabs that are non-moving and exhibit no evidence of active or inactive leakage.
  - b. Crack width limited to a range of 0.01" to 0.25" max.
  - c. Make repairs using a using a two-component epoxy resin injected under pressure.

d. Epoxy Resin for Pressure Injection

- (1) Use a two-component, 100-percent solids, moisture-tolerant, low viscosity, epoxy resin system specifically intended for pressure injecting cracks in concrete.
- (2) Products: Subject to compliance with requirements, provide one of the following:
  - (a) Sikadur 52; Sika Corporation, Lyndhurst, NJ
  - (b) Duralcrete LV; Euclid Chemical Company, Cleveland, OH
  - (c) SCB Concrecive 1350; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
  - (d) Or approved equal

2. Type B Concrete Crack Repair

- a. General: Applicable to repair of structural cracks in concrete walls and slabs that presently leak or exhibit signs of previous leakage.
- b. Crack width limited to a range of 0.01" to unlimited width.
- c. Make repairs using a hydrophobic polyethylene resin sealant injected under pressure.
- d. Polyurethane grout and accelerator system
  - (1) Use a non-toxic, low viscosity, hydrophobic polymer of the isocyanate type to be mixed with an accelerator based on tertiary amines with a controlled reaction time of one to 10 minutes depending on the mix preparation. When the grout is mixed with 0.5% to 5% accelerator, the mixture will react upon contact with water and expand to five to seven times its original volume and cure to a polyurethane foam.
  - (2) Products: Subject to compliance with requirements, provide one of the following:
    - (a) Hydro-Active Flex LV with accelerator Hydro-Active Flex Cat; DeNeef Construction Chemicals, Inc., Houston, TX
    - (b) Hydro-Active Flex SLV with accelerator Hydro-Active Flex Cat; DeNeef Construction Chemicals, Inc., Houston, TX

- (c) Scotch-Seal Chemical Grout 5600 (Foam); Avanti Grout, Webster, TX
    - (d) SikaFix HH LV; Sika Corporation, Lyndhurst, NJ
    - (e) Or approved equal
  - e. Reaction Time Accelerator: Type recommended by the manufacturer of the sealant for the specific joint surface and conditions.
3. Type C Concrete Crack Repair
- a. General: Applicable only to concrete elements that are not actively leaking or exhibit signs of previous leakage but are over 0.25" in width.
  - b. Vertical or Overhead Surfaces
    - (1) Use a two-component, 100-percent solids, moisture tolerant, high-strength, structural grade epoxy of paste consistency.
    - (2) Products: Subject to compliance with requirements, provide one of the following:
      - (a) Sikadur 33; Sika Corporation, Lyndhurst, NJ
      - (b) Euco #452 Gel Epoxy System; Euclid Chemical Company, Cleveland, OH
      - (c) NC Adhesive; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
      - (d) Or approved equal
  - c. Horizontal Surfaces
    - (1) Use a two-component, 100-percent solids, moisture-tolerant epoxy resin system.
    - (2) Products: Subject to compliance with requirements, provide one of the following:
      - (a) Sikadur 35; Sika Corporation, Lyndhurst, NJ
      - (b) Euco #452 Gel Epoxy System; Euclid Chemical Company, Cleveland, OH

- (c) NC LV Adhesive; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
  - (d) Or approved equal.
- 4. Epoxy Compounds for Surface Sealing Cracks and Securing Injection Ports:
  - a. Use a two-component, 100-percent solids, moisture-tolerant, high-modulus epoxy resin system specifically intended for surface sealing cracks and securing injection ports prior to pressure injection.
  - b. Products: Subject to compliance with requirements, provide one of the following:
    - (1) Sikadur 33; Sika Corporation, Lyndhurst, NJ
    - (2) Euco #452 Gel Epoxy System; Euclid Chemical Company, Cleveland, OH
    - (3) NC Adhesive; MBT Protection and Repair Division of BASF Building Systems, Shakopee, MN
    - (4) Or approved equal
- 5. Hairline cracks narrower than 0.01 inch (10 mils) shall not be repaired for any type of crack described herein.

### PART 3 EXECUTION

#### 3.01 PREPARATION AND EXECUTION

##### A. Shallow Concrete Spall Repairs (2" Deep Max.)

- 1. General
  - a. This work consists of the removal of unsound concrete and the repair of spalled and delaminated concrete surfaces not exceeding 2" in depth, using a polymer-modified structural repair mortar as determined on the basis of a field inspection conducted by the Contractor in the presence of the Commissioner.
  - b. Do not repair spalled or otherwise defective concrete surfaces less than 1/4" in depth unless otherwise directed by the Commissioner.

## 2. Repair Procedure

- a. Inspection: In the presence of the Commissioner, inspect concrete surfaces to determine the type of repair, limits and locations of all areas to be repaired as shallow concrete spall repair work under this Section.
- b. Make a 1" deep saw cut around the perimeter of the repair area. Saw cut area shall be approximately square or rectangular in shape. Remove spalled, scaled, loose and deteriorated concrete to sound matrix.
- c. Use a hand-held (maximum 28 lb. size) pneumatic hammer or other approved method to remove deteriorated concrete. Hydro-demolition techniques may also be employed subject to approval of the Commissioner.
- d. Determine sound matrix by observation of the concrete chipping operation, by sounding the concrete with a rod or hammer, or other device acceptable to the Commissioner. Afford and accommodate the Commissioner access to the work in progress and provide use of the chipping gun as a means of evaluating the quality of the residual matrix. The determination of "sound" matrix will be predicated on the general criterion that concrete which is difficult to remove is "sound".
- e. Where concrete removal exposes reinforcing bars, the concrete around the bar shall be removed to provide a 3/4-inch minimum annular space around the bar so that new repair mortar will completely encapsulate the reinforcing bar. Use caution where reinforcing steel is uncovered so as not to damage the steel or its bond in the surrounding concrete. Do not use pneumatic tools in direct contact with reinforcing steel. Use a hand-held (maximum 28 lb. size) pneumatic hammer for chipping behind reinforcing steel. Clean exposed reinforcing steel in accordance with SSPC-SP-2, Hand Tool Cleaning, or SSPC-SP-3, Power Tool Cleaning, to remove all contaminants, rust and rust scale. After cleaning, coat exposed surfaces of reinforcing bars with approved anti-corrosion protective coating in accordance with manufacturer's instructions.
  - (1) Where exposed existing reinforcing steel is severely corroded or damaged, cut out reinforcing steel and replace with new reinforcing steel of the same size and spacing. Where existing reinforcing steel is determined by the Commissioner to have insufficient cover, either replace reinforcing steel or adjust as directed. Attach new reinforcing steel behind existing reinforcement with a minimum lap splice applicable to the bar diameter as indicated on the Contract Drawings.
- f. After obtaining approval of the surface preparation, wet sandblast or water blast surface to remove contaminants and to provide a roughened

surface. Water blasting equipment shall be capable of delivering water pressures of 7,500 psi. Adjust water pressure based on surface conditions, as approved. Dampen the surface for a minimum of 2 hours immediately before applying repair mortar. Immediately before applying repair mortar, inspect and re-clean, as required or directed, surfaces to be repaired. Use compressed air to remove water and sand residue. Surfaces to be repaired shall not have standing or running water.

- g. Remove all debris from the site in accordance with the provisions of Section 02222 - Demolition and Removals.
- h. For repairs between 1/2" and 2" deep, install mechanical expansion or chemical adhesive anchors in the concrete substrate at the grid spacing indicated on the Contract Drawings. Maintain 3/4" minimum concrete cover. Do not install mechanical expansion anchors at spalled concrete surfaces less than 1/2" deep.
- i. Mixing and application of repair mortar: Thoroughly mix in accordance with manufacturer's written directions. Apply repair material in lifts to be flush with adjacent surfaces and protect against damage in accordance with the manufacturer's recommended installation and curing instructions.

**B. Deep Concrete Spall Repairs (Deeper than 2")**

- 1. General: This work consists of the removal of unsound concrete and the repair of spalled and delaminated concrete surfaces in areas greater than 2" deep, using formed, cast-in-place concrete as determined on the basis of a field inspection conducted by the Contractor in the presence of the Commissioner.
- 2. Mixing Concrete
  - a. For hand or batch mixing of concrete, provide scale(s) approved by the Commissioner in which cement and aggregate can be accurately weighed for the required mix proportions.
  - b. Provide measuring instruments with graduated markings in inches for the proportioning of the Air Entraining Admixture (AEA) and Water Reducing-High Range (WR-HR) admixture. Do not mix the AEA and the WR-HR together before adding to the mix; the resultant solution will not work. Do not add the AEA and WR-HR at the mixture simultaneously; these admixtures shall be added separately in the mixing cycle. Store, mix and use manufactured materials in strict accordance with the written recommendations of the respective manufacturer.



### 3. Repair Procedure

- a. Inspection: In the presence of the Commissioner, inspect concrete surfaces to be repaired under work of this Section to determine the type of repair, limits and locations of all areas to be repaired as deep concrete spall repair work under work of this Section.
- b. Make a 1" deep saw cut around the perimeter of the repair area. Saw cut area shall be approximately square or rectangular in shape. Remove spalled, scaled, loose and deteriorated concrete to sound concrete. Use a hand-held (maximum 28 lb. size) pneumatic hammer or other approved method for deteriorated concrete removal up to 3" in depth. Heavier jackhammers may be used for removals greater than 3" in depth. However, the use of hoerams or similar equipment is strictly prohibited. Hydro-demolition techniques may also be employed subject to approval of the Commissioner.
- c. Determine sound matrix by observation of the concrete chipping operation, by sounding the concrete with a rod or hammer, or other device acceptable to the Commissioner. Afford and accommodate the Commissioner access to the work in progress and provide use of the chipping gun as a means of evaluating the quality of the residual matrix. The determination of "sound" matrix will be predicated on the general criterion that concrete which is difficult to remove is "sound".
- d. Where concrete removal exposes reinforcing bars the concrete around the bar shall be removed to provide a 3/4-inch minimum annular space around the bar so that new concrete will completely encapsulate the reinforcing bar. Use caution where reinforcing steel is uncovered so as not to damage the steel or its bond in the surrounding concrete. Do not use pneumatic tools in direct contact with reinforcing steel. Use a hand-held (maximum 28 lb. size) pneumatic hammer for chipping behind reinforcing steel. Clean exposed reinforcing steel in accordance with SSPC-SP-2, Hand Tool Cleaning, or SSPC-SP-3, Power Tool Cleaning, to remove all contaminants, rust and rust scale. After cleaning, coat exposed surfaces of reinforcing bars with approved anti-corrosion protective coating in accordance with manufacturer's instructions.
  - (1) Where exposed existing reinforcing steel is severely corroded or damaged, cut out reinforcing steel and replace with new reinforcing steel of the same size and spacing. Where existing reinforcing steel is determined by the Commissioner to have insufficient cover, either replace reinforcing steel or adjust as directed. Attach new reinforcing steel behind existing reinforcement with a minimum lap splice applicable to the bar diameter as indicated on the Contract Drawings.

- e. After obtaining approval of the surface preparation, wet sandblast or water blast surface to remove contaminants and to provide a roughened surface. Water blasting equipment shall be capable of delivering water pressures of 7,500 psi. Adjust water pressure based on surface conditions, as approved. Dampen the surface for a minimum of 2 hours immediately before applying concrete. Immediately before applying concrete mortar, inspect and re-clean, as required or directed, surfaces to be repaired. Use compressed air to remove water and sand residue. Surfaces to be repaired shall not have standing or running water.
- f. Remove unsound concrete material and concrete encasements in a manner to facilitate the uniform placement of and to preclude the entrapment of air or forming of voids in the freshly placed structural repair concrete. Thoroughly air blast and vacuum the newly exposed area prior to forming.
- g. Remove all resulting debris from the site in accordance with the provisions of Section 02222 - Demolition and Removals.
- h. Render all surfaces of exposed concrete and reinforcing steel free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles and other foreign matter.
- i. Install mechanical expansion or chemical adhesive anchors in the concrete substrate at the grid spacing indicated on the Contract Drawings. Install welded wire fabric of the wire size and spacing shown on the Contract Drawings. Maintain 3/4" minimum concrete cover.
- j. Install formwork at demolished areas on vertical surfaces of concrete members in accordance with Section 03100 - Concrete Forms and Accessories. Coat forms with a plastic coating or similar type film to facilitate form removal. Design forms so that placement access will be at the top of each formwork assembly.
  - (1) Prior to forming vertical surfaces, install reinforcement as indicated on the Contract Drawings or as required and directed by the Commissioner.
- k. Do not use bonding compounds for placement of concrete. Dampen exposed concrete surfaces immediately prior to placement of fresh concrete.
  - (1) Place concrete in the maximum lift height possible and consolidate during placement with adequately sized vibrators.
  - (2) Small holes may be drilled into forms to permit air to escape during placement and consolidation.

1. After curing and stripping of forms, blend the patched areas to match the physical appearance of the adjacent area as close as possible.
  - (1) The Commissioner will sound the patched areas to detect the presence of voids, delaminations or hollow spots. Remove and repair such defects to the satisfaction of the Commissioner at no additional cost to the City of New York.

C. Concrete Crack Repairs

1. General
  - a. This work consists of repairing structural cracks greater than 0.01" in width as determined on the basis of a field inspection conducted by the Contractor in the presence of the Commissioner.
  - b. Hairline cracks less than 0.01" (10 mils) in width shall not be repaired.
  - c. Before crack repair work is commenced, clean slab and wall surfaces within 2 inches of the crack to remove mineral deposits, laitance, loose material on the surface, grease, oil and all visible contaminants.
2. Type A Concrete Crack Repairs Using Epoxy Pressure Injection (0.01" to 0.25" max. in width):
  - a. Apply this crack repair method to concrete elements that are not actively leaking or exhibit signs of previous leakage. Repairs shall be made using an approved two-component, epoxy compound suitable for repairing concrete cracks by pressure injection.
  - b. Use automated pressure injection equipment to supply, meter, mix and dispense the two components of the epoxy resin into the prepared cracks. The unit shall be portable and be equipped with positive displacement-type pumps with interlock to provide positive ratio control of exact proportions of the two components of the epoxy resin at the nozzle. The pumps shall be air powered or electric and shall be equipped with an in-line mixing and metering system and contain drain-back plugs.
  - c. Thoroughly clean structural cracks and completely remove foreign matter such as dirt, laitance, grease, salt or any other contaminants within 2 inches of the crack.
  - d. Apply approved epoxy surface seal compound to the face of the crack along its entire length prior to the application of injection material.

- e. Establish openings in the surface seal (entry ports) along the crack length as recommended by the technical representative of the manufacturer. The distance between the entry ports shall not be greater than the thickness of the concrete member being repaired. For structures accessible on both sides, provide porting devices on opposite sides at staggered elevations.
  - f. Begin the injection of the epoxy compound by pressure at the entry port at the lowest elevation. Continue injection at the first port until the injection material begins to flow out of the port at the next higher elevation or the adjacent port. Plug the first entry port and start injection at the second port and continue until the epoxy resin flows from the next port. Inject the entire crack length following the same sequence. Perform the entire technique in strict accordance with the manufacturer's on-site instructions.
  - g. After the injection compound has cured, remove the surface seal completely. Finish the face of the crack flush with the adjacent concrete surface. Indentations or protrusions caused by placement of entry ports will not be acceptable.
3. Type B Concrete Crack Repairs for Leaking Cracks Using Polyurethane Grout (0.01" to unlimited crack width):
- a. Apply this crack repair method only to repair of vertical and overhead cracks in concrete slabs and walls that presently leak or exhibit signs of previous leakage. Implement repairs using a hydrophobic polyethylene resin sealant injected under pressure.
  - b. Protect walls, floor slabs, ductwork, piping and lighting below repair area to prevent staining due to spillage and migration of sealant compound of the cracks.
  - c. Clean crack surfaces and remove all mineral deposits and foreign matter within 2 inches of the crack.
  - d. Determine location of existing slab, wall and/or beam reinforcing steel bars along the length of the crack using a pachometer or other suitable means.
  - e. Drill test injection holes, install test injectors and test pump water to determine spacing for injectors along the crack. Drill hole size and injector size shall be in accordance with the manufacturer's instructions. Do not drill through or damage existing reinforcing steel bars.
  - f. Drill remainder of holes for grout injection and install grout injectors. Do not drill through or damage existing reinforcing steel bars.

- g. Flush the crack with clean water to remove dirt, dust and other contaminants.
  - h. Install all materials in accordance with the manufacturer's instructions unless otherwise directed.
  - i. Do not install sealant at a temperature below 40° F. unless the manufacturer specifically permits application of those materials at a lower temperature. Consult with the manufacturer's representative.
  - j. Use pressure injection equipment of a type, capacity and mechanical condition suitable for performing the work. Ensure that the sealant plant is of the continuous mixing type and is capable of supplying, proportioning, mixing and pumping the sealant in accordance with the recommendations of the grout manufacturer. Ensure that the hoses, check valves and other equipment have low moisture permeability and are compatible with the sealant.
  - k. Pump water into cracks that appear to be dry prior to injecting sealant.
  - l. Begin sealant injection into a crack at the lowest elevation and proceed upward on vertical cracks or begin at one end and proceed toward the other end on horizontal cracks.
  - m. Pump sealant into the first injector until sealant is observed at the second. Close the valve on the first injector and disconnect the supply line. Pump sealant into the second injector and repeat operation until the crack has been completely sealed.
  - n. Plug sealant leaks immediately with rags or oakum dipped in hydrophilic sealant or by other methods approved by the manufacturer.
  - o. Remove injectors and other fittings after grout has reached gel point. Fill any remaining holes with cement grout of the formulation specified herein..
4. Type C Concrete Crack Repairs for V-Groove Repairs in Excess of 0.25" in Width:
- a. Apply this crack repair method only to concrete elements that are not actively leaking or exhibit signs of previous leakage but are over 0.25" in width.
  - b. Cut or chisel crack to a minimum depth of 3/4" with an inverted "V" shape of 3/4" width at the bottom.

- c. Remove loose particles, laitance, dust, grease and any other contaminants that would prevent bonding of the repair compound to the structure.
- d. Mix and apply appropriate repair compound in strict accordance with the manufacturer's directions depending on whether the crack is at a horizontal, vertical or overhead surface.

### 3.02 CURING

- A. Follow the recommendations of ACI 308.1 for curing concrete.
- B. Cure polymer-modified structural concrete mortar materials in accordance with manufacturer's instructions.
- C. Forms for formed patches shall be kept in place for a minimum of 48 hours.
- D. Curing methods shall be as approved. Perform curing as soon as possible after concrete placement and finishing.
- E. Where burlap is used to protect freshly placed concrete, maintain concrete temperature above 50° F. Keep burlap continuously wet for a period of 24 hours for structural repair mortar and at least 7 days for portland cement concrete.

### 3.03 FIELD QUALITY CONTROL

- A. Use adequate number of skilled personnel who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Manufacturer's Representative Services: Do not proceed with the first application of each concrete repair system without the Contractor's field personnel having received on-site detailed instructions from the product manufacturer's technical representative on the mixing, application and curing of the concrete repair materials for the intended use.
- C. Inspection and testing services required for concrete restoration work, including concrete materials and construction operations, will be provided by the Commissioner. The Commissioner will arrange for inspection of concrete materials at the mixer, concrete placement, and for the sampling and testing of concrete cylinders for Deep Spall Concrete Repairs similar to those services for cast-in-place concrete described in Section 03300 - Cast-in-Place Concrete.
  - 1. Cooperate with the Commissioner in the performance of its duties for concrete inspection and testing. Assist the Commissioner in performing applicable sampling and testing specified under Section 03300 - Cast-in-Place Concrete

during concrete restoration work by providing incidental labor to collect and store samples.

2. The Commissioner will have a qualified representative(s) at the job site to perform concrete testing and to make all necessary test cylinders. Do not place concrete without the Commissioner's on-site inspector present.
3. Testing acceptance criteria for concrete restoration work shall as defined for cast-in-place concrete in Section 03300 – Cast-in-Place Concrete.

### 3.04 REMEDIAL WORK

- A. Repair or replace deficient work as directed by the Commissioner and at no additional cost to the City of New York.
- B. Patch defective concrete surfaces with a suitable, approved patching material, mix or product as directed by the Commissioner.
- C. Formed concrete repairs shall conform to those described in Section 03350 – Concrete Finishes and as specified herein. Repair defective formed surfaces by removing minor honeycombs, pits greater than one square inch in surface area or 0.25 inch maximum depth, or otherwise defective areas. Remove all fins, burrs and other projections left by formwork removal in accordance with the provisions of Section 03100 - Concrete Forms and Accessories. Fill solid all holes, depressions and voids with cement grout after first being thoroughly wetted. Chip back honeycombs to solid concrete, as directed by the Commissioner, prior to patching with cement grout. Fill holes with a small tool that will permit packing the hole solidly with cement grout.
- D. Non-conforming Work: Repaired concrete surfaces which develop shrinkage cracks greater than approximately 0.01" (10 mils) wide, honeycombing or a large frequency of cracking within 28 days after installation shall be considered defective and shall be classified as non-conforming work.
- E. Repair or remove and replace non-conforming work as directed by the Commissioner and at no additional cost to the City of New York. Patch non-conforming repaired surfaces with a suitable, approved patching material, mix or product as approved by the Commissioner.

### 3.05 CLEANING

- A. As work progresses, immediately remove excess materials from adjacent surfaces with cleaning material recommended by the respective product manufacturer.
- B. Finish crack repair surfaces and unformed concrete spall repair surfaces to obtain a hard steel troweled finish meeting the finish requirements of a Type "D" finish described in Section 03350 – Concrete Finishes. Finish repaired surface flush with

adjacent concrete surface that will be left exposed or painted, including grinding as required.

- C. Do not discharge debris or waste into sewers or waste piping.
- D. Leave finished work in neat and clean condition.

-END OF SECTION-



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**Section 04201**  
**UNIT MASONRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes unit masonry assemblies consisting of the following:
1. Concrete masonry units (CMU)
  2. Pre faced concrete masonry units (GCMU)
  3. Mortar and grout
  4. Reinforcing steel
  5. Masonry joint reinforcement
  6. Ties and anchors
  7. Embedded flashing
  8. Miscellaneous masonry accessories
  9. Cavity-wall insulation
  10. Partition restraint system
- B. Products furnished, but not installed, under this Section include the following:
1. Dovetail slots for masonry anchors, installed under Section 03300 - Cast-in-Place Concrete.
  2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Section 05120 - Structural Steel.
  3. Manufactured reglets in masonry joints for metal flashing, furnished under Section 07620 - Sheet Metal Flashing and Trim.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02780 - Unit Pavers, for exterior unit masonry paving
- B. Section 03300 - Cast-in-Place Concrete, for masonry anchors installed in concrete
- C. Section 03450 - Plant-Precast Architectural Concrete for precast anchors installed in masonry
- D. Section 05500 - Metal Fabrications, for steel lintels, seismic restraint angles, and shelf angles for unit masonry
- E. Section 07115 - Bituminous Dampproofing, for dampproofing applied to cavity face of backup wythes of cavity walls
- F. Section 07210 - Building Insulation, for formed in-place cmu insulation

- G. Section 076620 - Sheet Metal Flashing and Trim, for sheet metal flashing
- H. Section 07811 - Sprayed Fire-Resistive Materials
- I. Section 07842 - Fire-Resistive Joint Systems, for fire-resistive joint systems at heads of masonry walls and firestopping at openings in masonry walls
- J. Section 07920 - Exterior Joint Sealants and Section 07921 - Interior Sealants, for sealing control and expansion joints in unit masonry
- K. Section 08520 - Aluminum Windows, for window work installed in masonry
- L. Section 08110 - Stainless Steel Doors and Frames and Section 08311 - Access Doors and Frames, for door frames installed in masonry
- M. Section 10200 - Louvers and Screens
- N. Sections related to Plumbing Work installed in masonry
- O. Sections related to HVAC Work installed in masonry
- P. Sections related to Electrical Work install in masonry

### 1.03 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells

### 1.04 PERFORMANCE REQUIREMENTS

- A. Provide load-bearing unit masonry that develops indicated net-area compressive strengths ( $f_m$ ) at 28 days. Comply with NYC Building Code requirements.
- B. Provide fire-rated unit masonry compliant with NYC Building Code requirements.

### 1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes and glazed finishes.
  - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications

- C. Samples for Initial Selection
1. Decorative glazed concrete masonry units, in the form of small-scale units.
  2. Colored mortar.
  3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
1. Exposed concrete masonry units
  2. Glazed concrete masonry units
  3. Special shapes
  4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
  5. Weep holes/vents
  6. Accessories embedded in masonry
- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Engineer and approved in writing.
- F. Qualification Data: For testing agency.
- G. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
1. Masonry units
    - a. Include material test reports substantiating compliance with requirements.
    - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  2. Cementitious materials. Include brand, type, and name of manufacturer.

3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Reinforcing bars
  6. Joint reinforcement
  7. Anchors, ties, and metal accessories
- H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports, per ASTM C780, for mortar mixes required to comply with property specification.
  2. Include test reports, per ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- I. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- J. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C1093 for testing indicated, as documented according to ASTM E548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Controlled Inspection Service: The City will engage a qualified independent testing agency to perform controlled inspection of masonry and reinforced masonry as required by NYC Building Code and as indicated below. Payment for these services will be made by the City. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C140
  2. Mortar Test (Property Specification): For each mix required, per ASTM C780
  3. Grout Test (Compressive Strength): For each mix required, per ASTM C1019
  4. Prism Test: For each type of construction required, per ASTM C1314
- E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- F. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1.
1. Build sample panels for each type of exposed unit masonry construction and typical exterior wall in sizes approximately 48 inches (1200 mm) long by 48 inches high by full thickness.
  2. Clean one-half of exposed faces of panels with masonry cleaner indicated.
  3. Protect approved sample panels from the elements with weather-resistant membrane.
  4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Engineer in writing.
    - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Engineer in writing.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of exposed unit masonry construction and typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least 16 inches (400 mm) long in each exterior wall mockup.
    - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top

of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
  - a. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.
  - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by The Engineer in writing.
5. Retain mock-ups until completion of masonry work. Remove mock-ups after masonry work has been accepted by Engineer.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 01310 – Project Coordination.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.08 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.



## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Subject to compliance with Project requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

## 2.02 MASONRY UNITS

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

## 2.03 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners, unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units at exterior or interior locations.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
    - a. Products
      - (1) Addiment Incorporated; Block Plus W-10
      - (2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block
      - (3) Master Builders, Inc.; Rheopel
      - (4) Or approved equal

- C. Concrete Masonry Units (CMU): Concrete units complying with ASTM C90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
  2. Weight Classification: Normal weight, unless where indicated
  3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions. Nominal units 4 by 8 by 16 inch; 6 by 8 by 16 inch and 8 by 8 by 16 inch.
- D. Pre-faced Concrete Masonry Units (GCMU): Concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
  2. Weight Classification: Lightweight
  3. Size (Width): Manufactured to dimensions specified in "Concrete Masonry Units" paragraph above, but with pre-faced surfaces having 1/16-inch wide returns of facing to create 1/4-inch wide mortar joints with modular coursing.
  4. Colors and Patterns: As selected by the Engineer from manufacturer's full range.
    - a. Special shapes: Provide manufacturer's standard units with glazed finish applied on exposed face. Provide corner units with glazed finish on 2 exposed faces. Provide bond-beam units with glazed finish on 3 exposed faces. Provide glazed bullnose units.

## 2.04 LINTELS

- A. Masonry Lintels (Bond Beams): Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.05 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

- 1. Products

- a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments
  - b. Davis Colors; True Tone Mortar Colors
  - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors
  - d. Or approved equal

- E. Colored Cement Product: Packaged blend made from Portland cement, lime, and mortar pigments, all complying with specified requirements, and containing no other ingredients.

- 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
  - 2. Pigments shall not exceed 10 percent of Portland cement by weight.

- 3. Products

- a. Colored Portland Cement-Lime Mix
    - (1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color
    - (2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime
    - (3) Lafarge North America Inc.; Eaglebond
    - (4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement
    - (5) Or approved equal

- F. Aggregate for Mortar: ASTM C144

- 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4-inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  3. White-Mortar Aggregates: Natural white sand or crushed white stone
  4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color
- G. Aggregate for Grout: ASTM C 404
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products
    - a. Addiment Incorporated; Mortar Kick
    - b. Euclid Chemical Company (The); Accelguard 80
    - c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset
    - d. Sonneborn, Div. of ChemRex; Trimix-NCA
    - e. Or approved equal
- I. Water: Potable
- 2.06 REINFORCEMENT
- A. Galvanized Steel Reinforcing Bars: ASTM A767, Grade 60
- B. Masonry Joint Reinforcement: ASTM A951
1. Interior Walls: Hot-dip galvanized, carbon steel
  2. Exterior Walls: Stainless steel
  3. Wire Size for Side Rods: W1.7 or 0.148-inch and W2.8 or 0.188-inch diameter to suit application
  4. Wire Size for Cross Rods: W1.7 or 0.148-inch and W2.8 or 0.188-inch diameter to suit application
  5. Wire Size for Veneer Ties: W1.7 or 0.148-inch and W2.8 or 0.188-inch diameter to suit application
  6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches on center

7. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.

- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized steel continuous wire.

## 2.07 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.

1. Stainless Steel bars: ASTM A666, Type 316

- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from stainless steel not less than 0.097 inch thick. Ties made from hot-dipped galvanized steel sheet may be used in interior walls, unless otherwise indicated.

- C. Wire Ties: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.

3. Wire: Fabricate from 1/4-inch diameter, stainless-steel wire; hot-dipped galvanized wire ties may be used in interior walls, unless otherwise indicated.

- E. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, stainless-steel wire; hot-dipped-galvanized wire may be used at interior walls, unless otherwise indicated.

2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, stainless-steel

wire; hot-dipped-galvanized wire may be used at interior walls, unless otherwise indicated.

3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.109-inch thick, stainless-steel sheet; 0.108-inch thick, hot-dipped-galvanized sheet may be used at interior walls, unless otherwise indicated.
  4. Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- F. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.
- H. Precast Concrete Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.
- 2.08 MISCELLANEOUS ANCHORS
- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
  - B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size to suit application, fabricated from 0.034-inch, stainless steel sheet.
  - C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, flat washers; hot-dip galvanized to comply with ASTM A153, Class C.
  - D. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
1. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 2 for bolts and nuts; ASTM A666 Type 316 for anchors.

**2.09 EMBEDDED FLASHING MATERIALS**

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Section 07620 - Sheet Metal Flashing and Trim and as follows:
1. Stainless Steel: ASTM A240, Type 304, 0.016 inch thick
  2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
  3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
    - a. Products
      - (1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth)
      - (2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
      - (3) Or approved equal
  4. Fabricate through-wall flashing with sealant stop, unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Solder and Sealants for Sheet Metal Flashings, unless otherwise indicated in Section 07620 - Sheet Metal Flashing and Trim, provide the following:
1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  2. Elastomeric Sealant: ASTM C 920, chemically curing sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

**2.10 MISCELLANEOUS MASONRY ACCESSORIES**

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness to suit application; formulated from neoprene or approved equal.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard block and to maintain lateral stability in masonry wall; size, and configuration to suit application.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No.15 asphalt felt).
- D. Weep/Vent Products: Use one of the following, unless otherwise indicated:
1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch outside diameter by 4 inches long.
  2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
    - a. Products
      - 1) Advanced Building Products Inc.; Mortar Maze weep vent
      - 2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents
      - 3) Heckmann Building Products Inc.; No.85 Cell Vent
      - 4) Hohmann & Barnard, Inc.; Quadro-Vent
      - 5) Wire-Bond; Cell Vent
      - 6) Or approved equal
- E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
1. Products
    - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817
    - b. Heckmann Building Products Inc.; Number. 376 Rebar Positioner
    - c. Hohmann & Barnard, Inc.; RB or RB-Twin Rebar Positioner
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner
    - e. Or approved equal



## 2.11 MASONRY-CELL INSULATION

- A. Coordinate requirements for installation of foamed in-place masonry cell insulation with Division 7 Section "Building Insulation".

## 2.12 CAVITY-WALL RIGID INSULATION

- A. Extruded-Polystyrene Board Insulation with Increased R-Value: ASTM C578, Type IV, but with an aged thermal resistance (R-value) for 1-inch thickness of 5.6 deg F x h x sq. ft./Btu at 75 deg F at 5 years; closed-cell product with a carbon-black filler and extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## 2.13 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

- 1. Manufacturers

- a. Diedrich Technologies, Inc.
  - b. EaCo Chem, Inc.
  - c. ProSoCo, Inc.
  - d. Or approved equal

## 2.14 MORTAR AND GROUT MIXES

- A. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

- 1. Do not use calcium chloride in mortar or grout.
  - 2. Limit cementitious materials in mortar to portland cement and lime.
  - 3. Add cold-weather admixture (if used) at same rate for mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
  - 4. Masonry Cement is not permitted.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C 270 or BIA Technical Notes 8A, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  - 1. For masonry below grade or in contact with earth, use TypeM
  - 2. For reinforced masonry, use TypeN
  - 3. For mortar parge coats, use TypeS
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.
  - 2. Mix to match the Engineer's sample.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  - 1. Mix to match the Engineer's sample.
- F. Grout for Unit Masonry: Comply with ASTM C476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

## 2.15 SOURCE QUALITY CONTROL

- A. The City will engage a qualified independent testing agency to perform source quality-control testing indicated below:
  - 1. Payment for these services will be made by the City.
  - 2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C140.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for plumbing, HVAC and electrical systems to verify actual locations of system components to be built into masonry work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- F. Comply with construction tolerances in ACI 530.1/ ASCE 6/ TMS 602 and with the following:
1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet or 1/2 inch maximum.
  2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
  3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, or 1/2 inch maximum.

4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.03 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  1. Lay GCMU in running bond pattern with glazed finish on all exposed faces.
- C. Lay concealed masonry with units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMU solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches on center, unless otherwise indicated.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07842 - Fire-Resistive Joint Systems.

### 3.04 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
  - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- D. Cut joints flush for masonry walls to receive bituminous dampproofing, tile or other direct-applied finishes (other than paint), unless otherwise indicated.

### 3.05 CAVITY WALLS

- A. Coat cavity face of backup wythe to comply with Section 07115 - Bituminous Dampproofing.
- B. Installing Cavity-Wall Insulation: Place small dabs of adhesive or mechanical fasteners, spaced approximately 12 inches on center<sup>4</sup> both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

### 3.06 MASONRY-CELL INSULATION

- A. Install molded-polystyrene insulation units into masonry unit cells before laying units.

### 3.07 MASONRY JOINT REINFORCEMENT

- A. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.08 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches on center horizontally.

### 3.09 CONTROL AND EXPANSION JOINTS

- A. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07921 - Interior Sealants, but not less than 3/8 inch.
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.10 LINTELS

- A. Install CMU or GCMU bond beam lintels where indicated and where openings of more than 24 inches for block-size units are indicated without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to permit upward flow of air in cavities, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
  - 3. At lintels and shelf angles, extend flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.

- C. Install weep holes in head joints in exterior wythes at precast panels.
- D. Install vents in head joints in exterior wythes at spacing indicated.

### 3.12 FIELD QUALITY CONTROL

- A. Inspectors: The City will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
  - 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: The City will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
  - 1. Payment for these services will be made by the City.
  - 2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C140.
- E. Mortar Test (Property Specification): For each mix provided, per ASTM C780.
- F. Grout Test (Compressive Strength): For each mix provided, per ASTM C1019.
- G. Prism Test: For each type of construction provided, per ASTM C1314 at 7 days and at 28 days.

### 3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.



D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry.

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain the Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

#### 3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

-END OF SECTION-

**Section 05081  
GALVANIZING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. All galvanizing of metals when such coating is specified or shown on the Contract Drawings, except as otherwise required.
- B. All galvanizing shall be done by the hot-dip process.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings

**1.03 REFERENCES**

- A. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- B. ASTM A90 - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- C. ASTM A111 - Zinc-Coated (Galvanized) "Iron" Telephone and Telegraph Wire
- D. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
- E. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire
- F. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- G. ASTM A143 - Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- H. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- I. ASTM A239 - Test Method for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip)
- J. ASTM A384 - Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies

- K. ASTM A385 - Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
- L. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric
- M. ASTM A475 - Zinc-Coated Steel Wire Strand
- N. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- O. ASTM A780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- P. ASTM A924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- Q. ASTM B6 - Specification for Zinc
- R. ASTM E536 - Test Methods for Chemical Analysis of Zinc and Zinc Alloys
- S. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated
- T. CSA G164-M - Hot Dip Galvanizing of Irregularly Shaped Articles
- U. American Galvanizers Association (AGA)
- V. Canadian Standards Association (CSA)

#### 1.04 TESTS

- A. General: Samples of galvanized articles shall be taken as specified in the appropriate ASTM standards listed in Table 1. Galvanized articles shall be tested to determine the following qualities of the coating:
  - 1. Thickness of coating
  - 2. Adherence
  - 3. Uniformity
- B. Thickness of the zinc coating may be tested either by the weighing or stripping methods in conformity with the requirements set forth in Table 1.
- C. Adherence of zinc coating shall be tested by the method indicated in the appropriate ASTM methods listed in Table 1.

D. Uniformity

1. Galvanized articles will be subjected to visual examination to determine uniformity of work.
2. In the event the Commissioner determines that such examination is not conclusive, the article shall be given the Preece test in conformity with ASTM A239.

1.05 SUBMITTALS

- A. The Contractor shall submit to the Commissioner, in accordance with the requirements of Section 01330 – Shop Drawings, the producer's or supplier's certification that the galvanized articles were manufactured, sampled, tested and inspected in accordance with the applicable standards specified herein and that the articles meet these requirements.

1.06 QUALIFICATIONS

- A. Galvanizing shall be done in a plant having sufficient facilities to produce the quality of coatings herein specified and ample capacity for the volume of work required.
- B. The plant shall follow the procedures in the Quality Assurance Manual of the AGA.

1.07 SHIPPING AND HANDLING

- A. Galvanized articles shall be shipped and handled in a manner that will avoid damage to the zinc coating.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Zinc used for galvanizing shall conform to ASTM B6, and shall be at least equal to the grade designated as Prime Western.
- B. Maximum amount of aluminum added to a galvanizing bath shall not exceed 0.01 percent.

PART 3 EXECUTION

3.01 PREPARATION OF MATERIALS

- A. Structural steel products shall be safeguarded against embrittlement in accordance with ASTM A143.

- B. Casting surfaces to be galvanized shall be sand blasted or ground smooth. When a smooth cast is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking. Malleable iron shall be safeguarded against embrittlement by pre-annealing.
- C. Steel work shall be pre-cleaned utilizing a caustic bath, acid pickle and flux or shall be blast cleaned and fluxed to obtain an acceptable surface for quality hot dip galvanizing.

### 3.02 METHOD OF GALVANIZING

- A. All galvanizing shall be done by the hot-dip process in conformity with the appropriate ASTM Specifications listed in Table 1.
- B. Methods tending to agitate the dross shall not be used, and materials shall not contact the dross at any time.
- C. Chemical analysis for impurities in the bath shall be made in conformity with ASTM E536.

### 3.03 SCHEDULE OF REQUIREMENTS

- A. Table 1 - Schedule of Hot-Dip Galvanizing Requirements
  - 1. The work shall conform to the requirements of the tabulated standards in Table 1, below.
- B. Notes Applicable to Table 1
  - 1. Prefixes A, B and E identify ASTM Specifications; prefix G identifies CSA Standard.
  - 2. Galvanized articles shall not be subject to wiping or scraping processes that may reduce the thickness of zinc coating.
  - 3. Small hardware items shall be centrifuged to remove excess bath metal.
- C. Quality of Coating
  - 1. The zinc coating shall meet the standards set forth in Table 1, ASTM A385 and CSA G164-M. The coating shall adhere firmly to the surface of the base metal, be continuous, uniform in thickness, and of the quality of finish specified.
  - 2. When special galvanizing, such as heavier coating, flexibility to permit forming operations and similar work is required, it shall be so specified in the relevant specification section for that item.

3. All rejected materials shall be stripped and regalvanized before resubmitting for inspection and test.

3.04 REPAIR OF GALVANIZED COATINGS

- A. Galvanized coatings that are abraded or damaged shall be repaired in accordance with ASTM A780.
- B. The extent of the area to be repaired and the method of repair to be used shall be approved by the Commissioner.

NO FURTHER TEXT ON THIS PAGE

TABLE 1 - SCHEDULE OF HOT-DIP GALVANIZING REQUIREMENTS

CLASS OF WORK	ZINC		TEST OF ZINC COATING				COATING THICKNESS	
	Slab & Chemical Analysis	Coating	Thickness		By Stripping	Adherence	Uniformity	Oz. Per Sq. Ft.
			By Weight	By Stripping				
IRON & STEEL STRUCTURAL								
• Rolled, pressed and forged, shapes, castings, plates, bars and strips								
• Gratings, iron and steel	B6, E536	A123	A123	A90, G164-M		A123	A123, A239	Table 1, A123
SHEETS								
• Iron and steel	B6, E536	A653	A653, A924	A90, A924		A653	A239	Table 1, A653
HARDWARE								
• Castings of malleable iron and steel								
• Rolled, pressed, forged articles								
• Threaded fasteners								
• Very small work: rivets, nails, tacks, pins, small bolts and screws, stove bolts	B6, E536	A153	A153	A90, G164-M		A153	A153, A239	Table 1, A153
• Turnbuckles and similar work								
• Chain								
WIRE								
• Line wire	B6, E536	A111	--	A90		A111	A111	Table 1, A111
• Fencing wire	B6, E536	A116	--	A90		--	--	Table 3, A116
• Fencing fabric, chain link	B6, E536	A392	--	A90		--	--	Tables 1 and 2, A392
• Barbed wire	B6, E536	A121	--	A90		--	--	Table 3, A121
• Strand wire	B6, E563	A475	--	A90		A475	A475	Table 4, A475
PIPE	B6, E536	A53	--	A90		A53	--	1.8 oz. per sq. ft.
ELECTRICAL CONDUIT (Rigid Steel)	Shall comply with ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.							

-END OF SECTION-

**Section 05120**  
**STRUCTURAL STEEL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate, shop paint and erect structural steel and appurtenances in accordance with the extent of work and the details indicated on the Contract Drawings, as specified herein and as required for a complete installation.
- B. Structural steel, as referenced herein, is that work defined in the AISC Code of Standard Practice and as otherwise shown on the Contract Drawings, including stiffeners, plates, sag rods and other miscellaneous metal required for a complete installation.
- C. This Section includes structural steel shapes, plates, bars and fasteners required for the fabrication and erection of miscellaneous structure supports, structure reinforcements, equipment supports and non-framing steel fabrications affecting structural steel.
- D. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- E. This Section includes, but is not limited to, the following items:
  - 1. Carbon and Stainless Steel
  - 2. Structural Steel: Plates, Shapes and Bars
  - 3. Structural Steel Tubing and Pipe
  - 4. Steel Armor Plate for Pushwalls
  - 5. Steel Armor Plate for Curbs and Loading Slots
  - 6. Anchor Bolts, Nuts and Washers
  - 7. Sag and Hanger Rods
  - 8. High Strength Fasteners: Bolts, Nuts and Washers
  - 9. Stainless Steel Fasteners: Bolts, Nuts, Coupling Nuts and Washers
  - 10. Welding Electrodes
  - 11. Headed Anchors (Welded Studs)
  - 12. Mechanical Expansion Anchors
  - 13. Chemical Adhesive Anchors
  - 14. Crane Rails and Accessories (Maintenance Bay)
  - 15. Removable Pipe Bollards
  - 16. Protective Coatings, Shop Applied
  - 17. Galvanizing Repair Paint



- F. This Section also includes support framing for small openings in steel floor and roof decking described in Sections 05311 - Steel Floor Deck and 05312 - Steel Roof Deck, respectively, and non-framing steel fabrications affecting structural steel work.
- G. Cold-formed metal framing, connectors and accessories are not included in this Section but are specified in Section 05400 - Cold-Formed Metal Framing.
- H. Metal stairs are not included in this Section but are specified in Section 05511 - Exterior Metal Stairs and Section 05512 - Interior Metal Stairs.
- I. Handrails and railings are not included in this Section but are specified in Section 05521 - Exterior Pipe and Tube Railings and Section 05522 - Interior Pipe and Tube Railings (Stainless Steel).

#### 1.02 RELATED SPECIFICATIONS

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 05311 - Steel Floor Deck
- C. Section 05312 - Steel Roof Deck
- D. Section 05400 - Cold-Formed Metal Framing
- E. Section 05511 - Exterior Metal Stairs
- F. Section 05512 - Interior Metal Stairs
- G. Section 05521 - Exterior Pipe and Tube Railings
- H. Section 05522 - Interior Pipe and Tube Railings (Stainless Steel)
- I. Section 05660 - Carriage Rail System
- J. Section 05675 - Crane Rail System
- K. Section 07811 - Sprayed Fire-Resistive Materials
- L. Section 09911 - Exterior Painting
- M. Section 09912 - Interior Painting
- N. Section 09967 - Coatings for Steel Waterfront Structures

#### 1.03 REFERENCES

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Institute of Steel Construction (AISC)
    - a. AISC Manual of Steel Construction, Specification for Structural Steel Buildings, Allowable Stress Design with Commentary and Supplements
    - b. AISC Code of Standard Practice for Steel Building and Bridges, with Commentary

- c. AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts with Commentary
- d. AISC Detailing for Steel Structures
- 2. American National Standards Institute (ANSI)
  - a. ANSI B18.2.1, Square and Hex Bolts
  - b. ANSI B18.2.2, Square and Hex Head Nuts
  - c. ANSI B18.22.1, Plain Washers
- 3. American Society for Testing and Materials (ASTM)
  - a. ASTM A6, General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
  - b. ASTM A36, Carbon Structural Steel
  - c. ASTM A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - d. ASTM A108, Steel Bar, Carbon and Alloy, Cold-Finished.
  - e. ASTM A123, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - f. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - g. ASTM A167, Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - h. ASTM A276, Stainless Steel Bars and Shapes
  - i. ASTM A307, Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
  - j. ASTM A325, High-Strength Bolts for Structural Steel Joints
  - k. ASTM A490, Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
  - l. ASTM A500, Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  - m. ASTM A563, Carbon and Alloy Steel Nuts
  - n. ASTM A572, High-Strength, Low-Alloy Columbium-Vanadium Structural Steel
  - o. ASTM A992, Steel for Structural Shapes for Use in Building Framing

- p. ASTM F436, Hardened Steel Washers
- q. ASTM F593, Stainless Steel Bolts, Hex Cap Screws, and Studs
- r. ASTM F594, Stainless Steel Nuts
- s. ASTM F1554, Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength
- 4. American National Standards Institute/American Welding Society (ANSI/AWS)
  - a. ANSI/AWS D1.1, Structural Welding Code - Steel
  - b. ANSI/AWS D1.5, Bridge Welding Code
- 5. Crane Manufacturers Association of America, Inc. (CMAA)
  - a. CMAA Specification 70, Specifications for Electric Overhead Traveling Cranes
- 6. City of New York:
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - b. New York City Board of Standards and Appeals, latest edition and amendments or supplements thereto.
- 7. Society for Protective Coatings (SSPC), formerly Steel Structures Painting Council
  - a. SSPC-SP 1, Solvent Cleaning
  - b. SSPC-SP 3, Power Tool Cleaning
  - c. SSPC-SP 6, Commercial Blast Cleaning

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Design of details not otherwise indicated, and fabrication, assembly, and inspection of steel structures shall conform to the following applicable specifications, codes and publications, latest issue, except as modified herein:
  - 1. AISC Manual of Steel Construction, Allowable Stress Design, including the following:
    - a. Specification for Structural Steel Buildings, Allowable Stress Design, with Commentary, AISC
    - b. Code of Standard Practice for Steel Buildings and Bridges, with Commentary, AISC

- c. Specification for Structural Joints Using ASTM A325 or A490 Bolts, with Commentary, Research Council on Structural Connections, endorsed by AISC
2. Structural Welding Code - Steel, ANSI/AWS D1.1
3. Bridge Welding Code, ANSI/AASHTO/AWS D1.5
4. Detailing for Structural Steel, AISC

#### 1.05 SUBMITTALS

A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:

1. Shop Drawings that depict all shop and erection layouts, details and schedules for fabrication and shop assembly of structural steel members including grade of steel; structural shapes, sizes and dimensions; crane rail and bumper stop details; welding technique and sequence, cuts, copes, gussets and all other members, connections, holes, fasteners, anchor bolts and setting plans; camber, fabrication and erection tolerances; surface preparation, type of primer paint system and other coatings, weights of members, and critical clearances. Indicate all surface finishes and welds both shop and field, by symbols conforming to ANSI/AWS Standards. Show relationship between structural steel, concrete, masonry and other materials and embedded items.
2. Design Calculations: Submit for review structural design calculations of all steel connections for which connection details or beam reaction values are not shown on the Contract Drawings. Calculations shall be prepared under the direct supervision of, and signed and sealed by, a licensed Professional Engineer registered in the State of New York and experienced in the structural design of structural steel connections.
3. Working Drawings that depict design and details of all required temporary supports, staying and bracing and shall include descriptive data, including design calculations, to illustrate the erection, transportation, and handling procedures including sequence of erecting and transfer of loads, if applicable.
4. Setting diagrams, templates, and directions for the installation of structural framing, anchor bolts, bearing plates, and other embedded items.
5. Do not commence shop fabrication until Shop Drawings and Working Drawings applicable to that portion of work have been reviewed and approved in writing by the Commissioner.
6. AISC Quality Certification Certificates, currently applicable, for steel fabricator and erector.

## 7. Welding Records and Data

- a. Procedure for pre-qualifying welders and welding procedures. For procedures other than those set forth in Paragraph 5.1 of ANSI/AWS D1.1, submit a copy of procedure qualification test records.
  - b. Certified copy of qualification test record for each welder, welding operator, and tacker who will be employed in the work, whether in the fabrication shop or in the field. All welders performing work within the city limits shall be certified by the City of New York in accordance with the latest rules of the New York City Board of Standards and Appeals and the current provisions of the New York City Building Code, Local Law 76/2008. All other welders shall be certified in accordance with ANSI/AWS D1.1, Structural Welding Code, Steel.
  - c. Descriptive data for field welding equipment, including type and electrical power requirements.
  - d. Test results of all non-destructive testing performed on field and shop welds.
8. Manufacturer's Data: Submit manufacturer's specifications, test reports and installation instructions for all proposed materials, products and accessories.
9. Notarized certificates of compliance for materials and products or certified copy of reports for analyses and tests required by referenced ASTM Specifications, including but limited to the following:
- a. Certified mill test reports
  - b. Affidavit of compliance with steel grade specified
  - c. Test reports for filler metals for welding
  - d. Mechanical test for high strength threaded fasteners
  - e. Paint certification.
10. Submit project-specific safety precautions proposed to prevent falls and provide fall protection during erection of structural steel.

## 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the New York City Board of Standards and Appeals, latest edition of each and amendments or supplements thereto. Work of this Section shall conform to all applicable Federal, State and local laws and regulations.

- B. Fabricator Qualifications: The steel fabricator shall be certified through the AISC Certification Program and designated as an AISC Certified Plant, Category STD, at time of bid.
- C. Erector Qualifications: The steel erector shall be a qualified installer who has participated in the AISC Certification Program and is designated as an AISC Certified Erector, Category CSE, at time of bid.
- D. Design of structural steel connections for which connection details or beam reaction values are not shown on the Contract Drawings shall be performed under the direct supervision of a licensed Professional Engineer registered in the State of New York and experienced in the structural design of structural steel connections.
- E. Testing and Inspection
  - 1. All welding operations and tensioning of high strength bolts, including material and fabrication procedures, shall be subject to special inspection in the mill, shop and field in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
  - 2. Special Inspections
    - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes, shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the New York City Construction Codes.
    - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.

- c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections.
  - d. The Contractor shall coordinate with the Commissioner to provide access and schedule the work for inspection by the Special Inspector.
3. Shop inspections may be made by the Special Inspector at their discretion. Provide at least 72 hours written notice to the Special Inspector prior to the beginning of any fabrication work so that inspection may be provided. Furnish all facilities for the inspection of materials and workmanship in the shop, and allow the inspectors free access to the necessary parts of the work.
- a. Special Inspectors shall have the authority to reject any material or work that does not meet the requirements of this Section.
  - b. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but it is expressly understood that it will in no way relieve the Contractor from the responsibility for furnishing proper materials or workmanship specified herein.
4. The Commissioner may elect to accept certificates of compliance for materials and products in lieu of specified testing procedures, except for materials and procedures for which special inspection is required.
5. Bolting
- a. The Special Inspector will inspect all field-assembled bolted construction in accordance with Section 9 of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts." The Special Inspector may verify the tightening of bolts by visual verification of the load indicator washer, by use of a direct tension indicator, or by using an inspection wrench in accordance with Section 9 of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts." The inspection wrench shall be used on the element turned to initially tighten the bolt.
  - b. Rejected bolts shall be either replaced or retightened as required. In cases of disputed bolt installation, the bolts in question shall be checked by a calibrated wrench certified by an independent testing laboratory. The cost of certification shall be at the Contractor's expense.
6. Welding Requirements
- a. All welding shall be performed by ANSI/AWS certified welders under the immediate supervision of a representative of the Special Inspector.

Cooperate with and assist the Special Inspector in the performance of its duties.

- b. All shop and field welds for structural steel will be visually inspected by an ANSI/AWS qualified welding inspector under the direction of the Special Inspector. The inspector will be an ANSI/AWS Certified Welding Inspector in accordance with the requirements specified in Section 6 of ANSI/AWS D1.1. The Special Inspector will furnish a letter of certification for each welded connection stating that these requirements have been met.
  - c. A minimum of ten (10) percent of all fillet welds greater in size than 5/16-inch and one-hundred (100) percent of partial and complete penetration welds which extend continuously for 24 inches or less will be completely tested by the Special Inspector. All butt and bevel welds which extend continuously for more than 24 inches will be spot tested at intervals not exceeding 36 inches. Acceptable non-destructive testing (NDT) methods shall be Radiographic Testing (RT), Ultrasonic Testing (UT) and Magnetic Particle Testing (MT) each being performed in accordance with ANSI/AWS D1.1, Chapter 6, Part D.
  - d. Welds that are required by the Special Inspector to be corrected shall be corrected or redone and retested as directed, at the Contractor's expense and to the satisfaction of the Special Inspector.
- F. Certifications: Certified mill test reports or certified tests made by the fabricator or a testing laboratory for structural steel in accordance with ASTM A6 and the governing specification shall constitute evidence of conformity with the ASTM Specification.
- G. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- H. Site Safety
- 1. Accept total responsibility for structural steel erection procedures and health and safety of the work force.
  - 2. Comply fully with OSHA workplace safety requirements and regulations and those of other authorities having jurisdiction.
  - 3. Provide and maintain OSHA-approved fall protection during erection of structural steel.
- I. Responsibility for Errors: Accept responsibility for errors of detailing and fabrication and for the correct fit of the work.



- J. Remedial Action: Promptly remove and replace materials, fabrications and workmanship found defective and provide new acceptable work in accordance with Contract requirements.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials to the site in an undamaged condition and at such intervals as will avoid delay in the work.
- B. Exercise care to avoid bending, scraping, and overstressing the steelwork. Block with wood or otherwise protect projecting parts likely to be bent or injured.
- C. Mark weight on all members. Match-mark all shop pre-fitted members.
- D. Ship small parts, such as rivets, bolts, nuts, washers, pins, fillers, and small connecting plates and anchors, in boxes, crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark an itemized list and description of contents on the outside of each container.
- E. Load, transport, unload, and store structural steel material in such a manner that the metal is kept clean and free from injury. Store material above ground on platforms, skids, or other supports, and cover and protect it from corrosion.
- F. Identify materials by heat and lot, if applicable.
- G. Replace pieces bent or damaged unless repairs are authorized by the Commissioner.

#### 1.08 PROJECT CONDITIONS

- A. General: Examine the areas and conditions under which structural steel is to be installed and notify the Commissioner promptly in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until disputed conditions, discrepancies and/or damages have been corrected, unless otherwise directed by the Commissioner.
- B. Field Measurements
  - 1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
  - 2. Take sufficient field measurements prior to preparation of Shop and Working Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.

3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 STRUCTURAL STEEL

- A. Provide structural steel in accordance with the following specifications as applicable and as indicated on the Contract Drawings.
  1. General Requirements: ASTM A6
  2. Structural Steel Wide Flange Shapes
    - a. Carbon Steel: ASTM A572, Grade 50 or ASTM A992 except ASTM A709, Grade 50 at exterior access ramps
    - b. Stainless Steel: ASTM A276, Type 304L
  3. Structural Steel Channels, Angles, Plates and Bars
    - a. Carbon Steel: ASTM A36 or ASTM A572, Grade 50
    - b. Stainless Steel: ASTM A167, Type 304L
  4. Rectangular or Square Tubing
    - a. Carbon Steel: ASTM A500, Grade B, Structural Grade ( $F_y = 46$  ksi)
    - b. Stainless Steel: ASTM A554, Seamless, Structural Grade
    - c. All members shall be furnished full length without splices unless otherwise noted or accepted by the Commissioner.
  5. Steel Pipe: ASTM A53, Grade B, Type S, black finish, extra strong (XS) or double extra strong (XXS) weight as indicated on the Contract Drawings.
  6. Steel Armor Plate for Pushwalls: Provide special abrasion resistant AR400 alloy steel plate for push wall protective facing; achieve desired properties through quenching and tempering of hardened wear resistant grade of abrasion resistant steel plate; provide hardened surface with smooth dark scale finish; brinell hardness between 360 and 440; minimum tensile strength of 180 ksi; nominal 140 ksi yield strength; sized in panels of the dimensions indicated on the Contract Drawings; leave exposed and unexposed surfaces unpainted.

7. Steel Armor Plate for Curbs and Loading Slots: ASTM A36 or ASTM A572, Grade 50 plate, as shown on the Contract Drawings. Galvanize after fabrication in accordance with ASTM A123.
  8. Anchor Bolts: ASTM A307, Grade C; ASTM A449 or ASTM F1554, Grade 36 or 55, non-headed type unless indicated otherwise, either bent or straight as indicated on the Contract Drawings. Galvanize anchor bolts, rods, nuts and washers under the supervision of the bolt manufacturer in accordance with ASTM A153, Class C.
  9. Sag and Hanger Rods: ASTM A307, Grade C, threaded each end, as shown on the Contract Drawings. Galvanize sag and hanger rods, nuts and washers in accordance with ASTM A153, Class C.
- B. Be advised that where specified structural steel shapes conforming to ASTM A36 are not readily available, ASTM A992 or ASTM A572 Grade 50 (with special requirements) may be substituted at no additional cost to the City of New York.

## 2.02 FASTENERS

- A. General: Furnish bolts, nuts and washers for a given grade and diameter of bolt from a single domestic manufacturer. For each diameter, only one grade may be used. Ship bolting materials to the job site in the bolt manufacturer's unopened containers with nuts and washers assembled and lot numbers marked on the container.
- B. Provide bolts and nuts that conform to applicable dimensional requirements of ANSI B18.2.1 for bolts and B18.2.2 for nuts.
- C. High Strength Bolts: Provide high-strength bolts conforming to the requirements of ASTM A325, Type 1, plain, for all bolted structural joints except where standard bolts conforming to ASTM A307 are specifically permitted on the Contract Drawings.
- D. Nuts: Nuts for ASTM A325 bolts shall conform to ASTM A563, Grade C, D, or DH or ASTM A194, Grade 2 or 2H.
- E. Washers: Hardened washers shall conform to ASTM F436 and the requirements of the Specification for Structural Joints Using ASTM A325 Bolts.
- F. Direct Tension Indicators: Compression-washer-type direct-tension indicators conforming to ASTM F959.
- G. Standard Carbon Steel Bolts and Nuts: Provide carbon steel bolts, where indicated on the Contract Drawings, meeting the requirements of ASTM A307, hex, Grade A or B. Nuts for A307 bolts shall conform to ASTM A563, Grade A.

- H. Anchor Bolts: ASTM A307, Grade C; ASTM A449 or ASTM F1554, Grade 36 or Grade 55, non-headed type unless indicated otherwise, either bent or straight as indicated on the Contract Drawings. Galvanize anchor bolts, rods, nuts and washers under the supervision of the bolt manufacturer in accordance with ASTM A153, Class C.
- I. Round Washers (other than those in contact with high-strength bolt heads and nuts): Provide round washers in accordance with ANSI B18.22.1.
- J. Beveled Washers (other than those in contact with high-strength bolt heads and nuts): Provide square, smooth and sloped washers to make contact surface of bolt head and nut parallel.
- K. Steel Plate Washers: Fabricate from ASTM A36 or ASTM A572 Grade 50 structural grade plate or bar for use in oversized, short-slotted and long-slotted holes. Conform to ASTM standards and the requirements of the Specification for Structural Joints Using ASTM A325 or A490 Bolts. Plate washers need not be fabricated from hardened steel.
- L. Stainless Steel Bolts: Provide stainless steel bolts conforming to ASTM F593 with nuts conforming to ASTM F594.
- M. Stainless Steel Coupling Nuts: Provide stainless steel coupling nuts conforming to the dimensions indicated on the Contract Drawings.
- N. Stainless Steel Screws: Provide stainless steel buttonhead screws conforming to the dimensions indicated on the Contract Drawings.
- O. Lubricant for Bolts: Provide molybdenum disulfide base lubricant for bolts.

## 2.03 WELDING ELECTRODES

- A. Use E70XX electrodes in conformance with ANSI/AWS Code. For field welding, use low hydrogen E70XX electrodes. No field welding will be permitted except where indicated on approved Shop Drawings and approved by the Commissioner.
- B. Use E316 electrodes for welding Type 316 stainless steel.
- C. Use E309 electrodes for welding stainless steel to carbon steel.

## 2.04 MISCELLANEOUS STEEL PRODUCTS

- A. Headed Anchors (Welded Studs): Provide weldable headed anchors meeting the requirements of ASTM A108 in accordance with ANSI/AWS D1; of the diameter and length shown on the Contract Drawings.

- B. Mechanical Expansion Anchors: Provide wedge-type mechanical expansion anchors manufactured from AISI 304 stainless steel meeting the requirements of Fed. Spec. A-A-1923 (formerly FF-S-325, Group II). Anchor may be headed, threaded or countersunk depending on intended use.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. HAD-P Undercut Anchor, Hilti, Inc., Tulsa, OK
    - b. TruBolt Wedge Anchors, ITW Red Head, Glendale Heights, IL
    - c. Strong Bolt, Simpson-Strong Tie Anchor Systems, Columbus, OH
    - d. Or approved equal
- C. Chemical Adhesive Anchors: Provide chemical adhesive anchors that consist of a stud-type, all-thread anchor rod, nut and washer, manufactured from AISI 304 stainless steel, and a two-part vinyl ester or structural epoxy resin adhesive and an amine-based hardener.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Epcon G5 Adhesive Anchoring System, ITW Red Head, Addison, IL
    - b. HVA Capsule Adhesive Anchoring System, Hilti, Inc., Tulsa, OK
    - c. Set-XP Epoxy-Tie, Simpson-Strong Tie Anchor Systems, Columbus, OH
    - d. Or approved equal
- D. Crane Rails and Accessories (Maintenance Bay): Furnish ASCE crane rail for maintenance bay crane designated for bridge crane runway service and conforming to crane rail manufacturer's material specifications and tolerances. Nominal weight of crane rail shall be as given on the Contract Drawings unless recommended otherwise by the approved bridge crane manufacturer. Furnish bolted splice bars fabricated as required to provide tight joints with finished rail ends. Provide adjustable bolted clip and filler type connection assembly in pairs with welded studs or machine bolts and self-locking nuts or nuts and lock washers. Floating type rail attachments will not be permitted.
1. Crane rails required for carriage track system and gantry crane rail system are not included in this Section but are specified in Sections 05660 and 05675, respectively.
  2. Furnish crane bumper stops and neoprene rubber bumper facing block as shown and located on the Contract Drawings.

- E. Removable Pipe Bollards: Provide prefabricated, removable pipe bollards that consist of round galvanized steel pipe that projects 36" above the floor surface and a flush-mounted, galvanized steel sleeve with flange and integral hinged locking lid. Provide either 3-1/2" O.D. by 0.216" wall thickness or 4" O.D. by 0.237" wall thickness pipe for portion of bollard that projects above the floor surface. Exposed portions of bollard shall be painted safety yellow. Bollard may be either twist-in or drop-in type. Provide removable padlock to lock bollard to sleeve when installed.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. TrafficGuard Round Post "Top-Lock" (Item No. TL1004RL), TrafficGuard Direct LLC, Geneva, IL
- b. External Padlocking/Removable Bollard (Item No. IBP4040), Cal Pipe Manufacturing, Hammond, IN
- c. Removable Posts w/Inserts and Flip Top (Model 102), ATEC Diversified Welding and Fabrication, Evansville, WY
- d. Or approved equal

## 2.05 NON-SHRINK GROUT

- A. Provide non-shrink grout in accordance with the provisions of Section 03300 - Cast-in-Place Concrete.

## 2.06 GALVANIZING REPAIR PAINT

- A. Provide high zinc-dust/zinc oxide content paint for repair of damaged galvanized surfaces and field touch-up of welds that meets the following requirements:
1. One application shall provide a minimum dry coating thickness of 2.0 mils.
  2. Dried film shall have a minimum zinc dust content equal to 94% by weight.
  3. The applied coating shall provide barrier protection and be anodic to steel.
  4. The coating may be applied under both shop and field conditions.
  5. The product used shall be approved by the galvanizer and shall be compatible with the galvanized surfaces and inert in concrete.

B. Products: Subject to compliance with requirements, provide one of the following:

1. ZRC, Z.R.C. Worldwide, Quincy, MA
2. Zinc Clad; Sherwin Williams, Cleveland, OH
3. Or approved equal

### PART 3 EXECUTION

#### 3.01 FABRICATION

A. General

1. The fabricator shall provide an affidavit stating that the structural steel furnished meets the requirements of the grade specified. All unidentified steel will be rejected and shall be removed from the site and replaced by the Contractor, at no additional cost to the City of New York.
2. Fabricate and shop-assemble work in accordance with AISC Specification for Structural Steel Buildings; Code of Standard Practice for Steel Buildings and Bridges; and Specification for Structural Joints Using ASTM A325 or A490 Bolts.
3. Members shall be straight and shall fit closely together. The finished work shall be free from burrs, twists, bends, open joints and other imperfections.

B. Connections

1. Unless noted otherwise herein or on the Contract Drawings, all beam connections shall be designed for reaction values indicated on the Contract Drawings.
2. Wherever beam reaction values or connection details are not shown, design the minimum connection to support one-half (50%) of the total uniform load capacity tabulated in the AISC tables for allowable loads for laterally supported beams for the given shape, span, and steel specified for the beam in question. Where the number of bolts is not indicated, connections shall be full depth. Design of structural steel connections for which connection details or beam reaction values are not shown on the Contract Drawings shall be prepared under the supervision of a licensed Professional Engineer registered in the State of New York.
3. Use high-strength bolted connections of the size and type indicated on the Contract Drawings. Use beveled washers against sloping flanges. Contact joint surfaces of friction-type bolted connections shall be free of oil, lacquer or other contaminants.

4. Bolted connections for secondary members (such as girts and stair framing) may be made with 3/4-inch diameter machine bolts conforming to ASTM A307.
  5. Gusset plates and connection angles shall be 3/8" minimum in thickness.
  6. Beam-splice connections are not permitted unless shown on the Contract Drawings.
  7. Where a beam connection is required to carry moment, design the connection for the allowable moment capacity of the smallest connected member.
- C. Bracing and bracing connections shall have a minimum of two bolts or the equivalent in weld strength unless otherwise shown on the Contract Drawings or approved Shop Drawings.
- D. Bearing stiffeners and stiffeners intended to support concentrated loads shall have full bearing on flanges to which they transmit load and on those from which they receive load. Mill or grind stiffener bearing surfaces. On weldable steel in compression areas of flanges, stiffeners may be welded as indicated. Stiffeners not located at points of concentrated loads shall be tight to that degree which will exclude water after being painted, unless otherwise indicated.
- E. Indicated steel dimensions are those which shall exist when ambient worksite temperature is 60E F. Dimensions at fabrication time shall be based on the formula:

$$L = D[1+ET]$$

where     L = Dimension at fabrication time, in inches.  
           D = Indicated steel dimensions, in inches.  
           E = 0.0000065  
           T = T(fab) - 60  
           T(fab) = Temperature at fabrication time in °F

- F. Plane sheared edges of plates thicker than 5/8" and carrying calculated stress to a depth of 1/4". If so indicated, face abutting joints and bring those joints to an even bearing. Build floor beams, stringers, and girders having end connection angles to exact length, back-to-back, of connection angles. If end connections are faced, finished thickness of angle shall be not thinner than that indicated. Machine-flatten metal bearing surfaces which will contact cement mortar grout to within 1/8" tolerance in 1" and to within 3/16" overall.
- G. Welding: Perform welding in accordance with ANSI/AWS D1.1 except as modified herein.
1. Perform procedure and sequence of welding so as to avoid unnecessary distortion and minimize stresses.



2. Make allowance in shop for expected weld shrinkage in laying out and assembling members. Trim members to size only when most or all of welding has been completed.
3. Repair defective welds by chipping or melting out such defects from one or more sides of joint as required removing only weld metal necessary to correct defect. Reweld and have weld tested, as directed by the Commissioner and at no additional cost to the City of New York.

H. Crane Rails and Attachments (Maintenance Bay)

1. Furnish crane rails for maintenance bay crane in standard and odd lengths as required to provide staggered joints on opposite sides of the crane runway and with due consideration to the wheelbase dimension of the approved bridge crane. Odd lengths required to complete a run or obtain the necessary stagger shall not be less than 10 feet long.
  2. Finish rail ends by milling or grinding to obtain tight splice joints. Perform special crane rail drilling and joint bar punching as required to match the pieces and provide tight splice joints.
  3. Fabricate adjustable bolted clip and filler type connection assemblies to permit longitudinal and controlled transverse movement through clamp clearances and filler adjustment. Conform to crane rail manufacturer's recommendations for bolt size, gage and detailed fabrication. Floating type rail attachments will not be permitted.
  4. Fabricate crane bumper stop and neoprene rubber bumper facing as detailed on the Contract Drawings.
- I. Mill or saw cut columns at bearing ends. Protect surfaces of bearing ends from corrosion. Holes in column base plates shall be 5/16" larger diameter than bolt size to allow for field adjustment unless otherwise indicated on the Contract Drawings.
- J. Provide holes in structural steel members required for anchors, anchor bolts, bolt holes, connection angles, supports and braces for stair stringers, equipment apparatus, sag rods, or other members noted on the Contract Drawings shall be provided by the fabricator and detailed on the Shop Drawings.
- K. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, where indicated on the Contract Drawings. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- L. Provide slotted or oversized holes in framing members where indicated on the Contract Drawings or where necessary to facilitate steel erection. Hole sizes and slot lengths shall conform to AISC standards.

- M. Where shop assembly of field connections is shown, specified or required, the unmatched holes shall be reamed and the pieces match-marked before disassembly. The interchange of matching parts will not be permitted.
- N. The Special Inspector will visually inspect all field welds, except puddle welds, and test ten (10) percent of all field welds by appropriate non-destructive testing method as described in ANSI/AWS D1.1. Acceptance criteria shall be as defined in ANSI/AWS D1.1.

### 3.02 PROTECTIVE COATINGS

- A. Examination: At the request of the City of New York, provide access and pay all costs for the Special Inspector and the Commissioner to visit the fabricator's facility to inspect structural steel immediately prior to painting operations.
- B. Surface Preparation: After fabrication and before painting or galvanizing, clean new and existing steelwork to be painted or galvanized by removing loose rust, loose mill scale, and spatter, slag or flux deposits. Clean new structural steel prior to galvanizing and existing steel prior to painting in accordance with SSPC-SP 10 and SSPC-SP 6, respectively.
- C. Galvanizing: Hot-dip galvanized structural steel products and appurtenances indicated on the Contract Drawings to be galvanized after fabrication in accordance with ASTM A123 and A153, as applicable. Fabricate products either complete or in largest practical sections before galvanizing. Weight of zinc coating shall be Coating Grade 85 (2.0 oz. per square foot) as specified in ASTM A123, Section 6.
  - 1. Advise the galvanizer, in writing, that the galvanized steel surfaces will be painted after galvanizing.
  - 2. Coordinate with the galvanizer to locate and provide adequately sized drainage holes for welded assemblies as required.
  - 3. Portions of new steel surfaces to be machined or field welded shall be masked off to exclude galvanizing.
  - 4. Stainless steel shall not be galvanized.
- D. Shop Painting
  - 1. Perform shop painting in accordance with the requirements of Sections 09911, 09912 or 09967, as applicable.
  - 2. Shop paint new structural and miscellaneous steel not otherwise galvanized or coated as specified herein, except as given below.
    - a. Apply structural steel primer paint to all new steel surfaces including those to be encased in concrete or those that will receive cementitious or

intumescent mastic fire-resistive materials but not those to be machined or welded.

- b. Ensure that the approved primer is compatible with the approved cementitious or intumescent mastic fire-resistive materials as described in Section 07811 - Sprayed Fire-Resistive Materials.
- c. Primer paint shall be applied to faying surfaces (i.e. contact surfaces) at high-strength bolted with slip-critical (friction-type) connections provided that the coating is certified to provide a Class A or Class B faying surface in accordance with the test method adopted by Research Council on Structural Connections (RCSC) as presented in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - (1) Section 5.4 of the RCSC specification defines a Class A faying surface as an uncoated clean mill steel surface or blast-cleaned steel surface protected by a Class A coating with a coefficient of friction not less than 0.33.
  - (2) A Class B faying surface is similarly defined as an uncoated blast-cleaned steel surface or a surface protected by a Class B coating on blast-cleaned steel with a coefficient of friction not less than 0.50.
- d. If coating requirements of sub-paragraph 3.02.D.2.c, above, cannot be met, faying surfaces at slip-critical connections shall be masked off to exclude paint including inadvertent overspray. Uncoated faying surfaces shall be free of scale, except tight mill scale, and free of coatings in areas closer than one bolt diameter but not less than one inch from the edge of any hole and in all areas within the bolt pattern.

### 3. Shop Coat

- a. Prime Coat: Immediately after surface preparation, apply shop prime paint as specified in Sections 09911, 09912 or 09967, as applicable, and in accordance with manufacturer's instructions. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces.
- b. Intermediate Coat: Apply structural steel intermediate coat to all new steel surfaces except those to be machined, welded, or high-strength bolted with slip-critical (friction-type) connections, encased in concrete or those that will receive sprayed fire-resistant materials. Mask the entire faying surface between parts at high-strength bolted connections to prevent overspray of intermediate coat onto primed faying surfaces.
- c. Finish painting of structural steel shall be performed in the field as specified in Sections 09911 - Exterior Painting, 09912 - Interior

Painting or 09967 – Coatings for Steel Waterfront Structures, as applicable.

- d. Stainless steel shall not be primed or painted.

E. Field Painting

1. Plies of slip-critical joints with coated faying surfaces shall not be assembled before the coating has cured for the minimum time that was used in the coating qualifying tests.
2. Field painting shall not proceed until all erection is complete including field bolting and field welding unless otherwise permitted by the City of New York.
3. Touch-up paint shop coated surfaces damaged during erection, exposed surfaces of fasteners and field welds with prime coat paint specified for the shop.
4. Apply intermediate and final coats in accordance with Sections 09911 – Exterior Painting, 09912 – Interior Painting or 09967 – Coatings for Steel Waterfront Structures, as applicable.

3.03 ERECTION

- A. Erection shall be in accordance with the Contract Documents, AISC Manual of Steel Construction, AISC Code of Standard Practice for Steel Buildings and Bridges, OSHA 29 CFR Part 1910 and Part 1926, and any other applicable state, municipal, or local regulations or codes.
- B. Report any damage caused during erection to the Commissioner. Complete corrective measures as directed by the Commissioner at no cost to the City of New York.
- C. Do not place temporary erection loads or permanent loads on any incomplete portions of the structure being erected unless it can be demonstrated by analysis in writing that the contemplated action is safe.
- D. Keep loose timbers, metal sheeting, bolt buckles, tools, debris, and temporary scaffolding restrained or removed from work areas. Assume responsibility for securing all equipment and materials within the steel erector's care, custody, and control during the erection operation.
- E. Maintain the job site in clean and safe condition at all times and properly dispose of, off premises, all crating, waste materials, and other refuse which has accumulated as a result of erection activities.

- F. Perform lifting of painted structural members with a non-abrasive choker.
- G. Keep a daily record, by piece number, of all material erected.
- H. Before commencing work, check foundations and other connection points to confirm their location, orientation, elevation, and condition.
- I. Anchor Bolts
  - 1. All anchor bolts for structural steel erection and other incidental items of the structural steel required to be built into concrete shall be properly set and securely held in position in the forms before the concrete is placed.
  - 2. Install anchor bolts accurately in position shown on the approved erection drawings within the permissible dimensional variations given in the AISC Code of Standard Practice.
  - 3. If anchor bolts are cast in substructure when it is being constructed, ensure that they are firmly held in their correct position and elevation by suitable templates. Set anchor bolts accurately to the template to provide suitable projection above concrete and/or grout as specified in AISC Code of Standard Practice. Set anchor bolts perpendicular to the theoretical bearing surface.
  - 4. If approval is given for installing anchor bolts in preformed holes or in drilled holes in concrete or masonry, use approved epoxy resin product as specified in Section 03300 - Cast-in-Place Concrete, for securing them in place.
  - 5. Where misalignment between anchor bolts and bolt holes in steel members is encountered, notify the Commissioner immediately. Submit a method to remedy the misalignment for review and approval by the Commissioner.
- J. Align column bases with leveling nut and steel shims as required. Shim bearing plates for beams and similar structural members with steel wedges or shims. Allowable deviation from a true horizontal plane shall not exceed 1/8" in 12 inches. After the supported members have been aligned and properly positioned and the anchor nuts have been tightened, fill the entire area under bearing plates with non-shrink grout material. Follow written procedures of the grout manufacturer.
- K. Erect steel structures true and plumb following the match marks.
- L. Use temporary supports and bracing to stabilize the structure against construction loads and all external imposed loads to which the structure may be subjected, including those from erection equipment or the operation of the same as specified in Division 1 - General Requirements. Field connections for structural steel falsework shall be made with ASTM A325 or A490 bolts with slip-critical (friction-type) connections. Leave temporary supports and bracing in place as long as may be

required for safety and, in any case, until all structural framing members are permanently installed.

M. Misfits at Bolted Connections

1. Where misfits in erection bolting are encountered, the Commissioner shall be immediately notified. Submit a method to remedy the misfit for review by the Commissioner. The Commissioner will determine whether the remedy is acceptable or if the member is required to be refabricated.
2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. Notify the Commissioner immediately and submit a proposed method of remedy for review by the Commissioner.

N. Field Assembly

1. All materials shall be properly worked and match-marked for field assembly. Where finishing is required, complete assembly including bolting and welding of units before start of finishing operations.
2. Splice only where indicated on the approved Shop Drawings.
3. Align and adjust members forming parts of a complete assembly after assembly and before fastening.
4. Thoroughly clean surfaces to be joined together.
5. Fasten splices of compression members after the abutting surfaces have been brought completely into contact.
6. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
7. All field connections shall be accurately fitted up before being bolted. Limit drifting only to the extent that will bring the parts into position and not cause enlargement of the holes or distortion of the metal. Drill or ream all unfair holes.

O. Report immediately to the Commissioner errors in shop fabrication or deformation resulting from handling or transportation which prevents the proper erection and fitting of parts.

P. Grouting of Base Plates and Bearing Plates: All loose column base plates and billets shall be accurately set to the designated levels on steel wedges or angle screeds in preparation for grouting.

1. Prior to the placement of non-shrink grout beneath base and bearing plates, clean the bottom surface of the plates of all foreign materials, and clean concrete and masonry bearing surfaces of all foreign materials and roughen surface to improve bonding.
  2. Tighten anchor bolts after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.
  3. Grout base plates with non-shrink grout to assure full uniform bearing. Perform grouting prior to placing loads on the structure.
- Q. As erection progresses, perform sufficient bolting of the work to support dead load, wind load and erection loads. Perform permanent bolting when final alignment is completed.
- R. Ensure that holes are not enlarged and that the drifting done during assembly does not disturb or damage the metal in the vicinity of the holes.
- S. Enlarge holes to admit bolts for connections only if approved by the Commissioner. Make enlargements by reaming or drilling and not by burning. Avoid hand reaming. Do not burn holes through in the field to accommodate bolts.
- T. Do not weld main stress members in the field unless otherwise indicated on the Contract Drawings or on reviewed Shop Drawings.
- U. Bolted Connections
1. Install high-strength bolts in accordance with the "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  2. Furnish and install high-strength bolts, washers and nuts in conformity with all resolutions of the Board of Standards and Appeals, relevant sections of the New York City Building Code, Local Law 76/2008, and the latest rules relating to high-strength bolts by the New York City Buildings Department.
  3. Use indicator washers as the approved direct tension indicator at the Contractor's option. Direct tension indicator washers shall be installed according to the manufacturer's published specifications.
  4. Do not inter-mix mechanically galvanized bolts and nuts with hot-dip galvanized nuts and bolts.
  5. Color code, die punch, or otherwise mark the ends of torqued bolts indicating that the bolts have been properly tensioned and are ready for inspection.
  6. Alternate Fastener Systems for Field Bolted Connections (Tension Control Bolts) - Tension Control (T/C) Bolts may be used for field connections only,

at the Contractor's option at no additional cost to the City of New York, provided that the following criteria are met:

- a. Supply all bolts from a single manufacturer and with a single specified head marking representing that manufacturer. Submit this marking to the Commissioner for its record. Other T/C bolts with different markings will be rejected.
- b. Submit bolt certifications for all bolts, nuts and washers to the Commissioner certifying their compliance with ASTM A325 or ASTM A490.
- c. Bolt testing for both chemical and physical properties shall be performed upon a random selection of T/C bolts as selected by the Commissioner. A minimum of five (5) bolts will be randomly selected and tested in accordance with ASTM A325 or A490.
- d. Submit installation procedures for tightening, retightening and removal of T/C bolts to the Commissioner for their review. These procedures and any comments generated shall be agreed to and implemented in the field.
- e. Keep a "Skidmore" wrench at the site at all times for the purpose of calibration of the wrenches in the morning and afternoon in the presence of the Commissioner.
- f. Guidelines and procedures for testing and inspection of the T/C bolts shall be reviewed in a pre-construction conference.

#### V. Welded Connections

1. Weld in accordance with ANSI/AWS D1.1, except as modified herein. Bolts for temporarily fastening welded splices and welded connections shall be either tightened securely and left in place or removed and the holes filled with high strength bolts and fully torqued. If left in place, burn off portion of bolt which projects beyond nut. If bolt does not project beyond nut, tack weld end of bolt to nut. Burn off and tack weld before painting. Location and number of welded splices shall be as indicated on the Contract Drawings or on approved Shop Drawings.
2. Make all welds continuous unless alternate welding procedures are shown on the approved Shop Drawings or approved in writing by the Commissioner.
3. Field Welds: Surfaces within 2 inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.



- W. Stud Shear Connectors: Prior to welding stud shear connectors, prepare steel surfaces as recommended by the manufacturer of the connectors. As a minimum, remove any paint, oil, grease, loose mill scale and any other substance that may impair the proper welding of the stud. Weld only on dry surfaces. Weld connectors at the spacing shown on the Contract Drawings. Use automatic end welding of stud shear connectors in accordance with the manufacturer's printed instructions.
- X. Crane Rails and Attachments (Maintenance Bay)
1. Install crane rails on crane girder in conformance with approved layout and attachments. Stagger rail splices on each side of crane runway; do not locate rail splices at columns or over crane girder discontinuity. Attachments shall conform to CMAA Specification 70.
  2. Install crane bumper stops and rubber bumper facing as shown on the Contract Drawings. Weld to crane rails at the required locations in accordance with the details shown on the Contract Drawings.
- Y. Cutting and Burning: The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on a stress-carrying structural steel member. Its use may be permitted on other members if the member is not under stress, and only after the written approval of the Commissioner has been obtained.
1. No cutting of structural steel members in the field will be allowed except by written approval of the Commissioner.
  2. All cutting shall be done with an oxyacetylene torch in conformity with the New York City Building Code, Local Law 76/2008 and the latest rules of the Board of Standards and Appeals.
- Z. Install mechanical expansion anchors and chemical adhesive anchors in strict accordance with the manufacturer's written instructions and recommendations.

### 3.04 FIELD QUALITY CONTROL

- A. Perform pertinent field inspection and testing specified in Article 1.06.E and 1.06.F.
- B. Correction of Defects
1. Report immediately to the Commissioner errors in shop fabrication or deformation resulting from handling or transportation which prevents the proper erection and fitting of parts.
  2. No packing, shimming, filling, or wedging will be permitted to correct defects unless approved by the Commissioner.

3. Provide a sufficient quantity of shim plates to fill the spaces at field bolted connections. Maximum total thickness shall not exceed tolerances permitted by the AISC Code of Standard Practice.
4. Repair damaged areas of hot-dip galvanized surfaces with approved zinc cold galvanizing compound.
  - a. Surface Preparation: Remove foreign matter from damaged area and from adjacent undamaged area. Solvent clean per SSPC-SP1 followed by power tool cleaning per SSPC-SP3.
  - b. Immediately thereafter, apply cold galvanizing compound to the prepared area at the rate of 2.0 mils dry film thickness (400 square feet/gallon).
5. Repair all fielding storage, handling and erection damage to shop-applied paint coatings in accordance with the appropriate painting specification Sections 09911 – Exterior Painting, 09912 – Interior Painting and 09967 – Coating for Steel Waterfront Structures. Paint all galvanized bolt assemblies tightened against shop-applied paint.

C. Non-conforming Work

1. Repair or replace non-conforming structural steel work as directed by the Commissioner and at no additional cost to the City of New York.
2. Promptly remove and replace materials, fabrications and workmanship found defective and provide new acceptable work in accordance with applicable Contract requirements.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 05311**  
**STEEL FLOOR DECK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install non-cellular composite steel floor decking, non-composite steel form decking and appurtenant items, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. This Section includes, but is not limited to, the following items:
  - 1. Composite Steel Floor Deck Units
  - 2. Non-Composite Steel Form Deck Units
  - 3. Galvanized Finish
  - 4. Formed Metal Closure Strips or Plates
  - 5. Formed Metal Cover Plates
  - 6. Welding Washers
  - 7. Sheet Metal Accessories
  - 8. Galvanizing Repair Paint
- C. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- D. Steel roof deck is not included in this Section, but is specified in Section 05312 – Steel Roof Deck.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03200 - Concrete Reinforcement
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 05120 - Structural Steel

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Iron and Steel Institute (AISI)
    - a. AISI Specification for the Design of Cold-Formed Steel Structural Members

- b. AISI Cold-Formed Steel Design Manual
- 2. American Society for Testing and Materials (ASTM)
  - a. ASTM A36, Carbon Structural Steel
  - b. ASTM A653, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - c. ASTM A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
  - d. ASTM A924, General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- 3. American National Standards Institute/American Welding Society (ANSI/AWS)
  - a. ASTM/AWS D1.1, Structural Welding Code - Steel
  - b. ASTM/AWS D1.3, Structural Welding Code - Sheet Steel
- 4. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto
- 5. Steel Deck Institute (SDI)
  - a. SDI Design Manual for Composite Decks, Form Decks and Roof Decks, Publication No. 30
  - b. SDI Diaphragm Design Manual, Second Edition, Publication DDM02
  - c. SDI Standard Practice Details, Publication SPD2
- 6. Society for Protective Coatings (SSPC), formerly Steel Structures Painting Council: SSPC-SP-2, Hand Tool Cleaning

## 1.04 DESIGN AND PERFORMANCE REQUIREMENTS

### A. General

1. General: The Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks shall govern the work under this Section unless noted otherwise.
2. Design Basis: The minimum depth, gauge and sectional properties of each type of steel floor deck required shall be as indicated on the Contract Drawings. The concrete slab thickness and reinforcement for composite steel floor deck shall be as indicated on the Contract Drawings.
3. Design Calculations: Provide manufacturer-certified structural calculations to verify that proposed steel floor deck meets minimum design requirements based on sectional properties calculated in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members. Coefficients for moments and deflections shall conform to the Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks.
4. Deck units shall have a ribbed, non-cellular section providing a satisfactory surface for the reception of design loads. Wherever practicable, units shall be of sufficient length to span three or more supports.

### B. Allowable Deflection

1. Composite Floor Deck: Composite steel floor deck shall not exceed the maximum construction span recommended by the steel floor deck manufacturer under uniform design construction loads, including dead weight of wet concrete. Composite floor deck deflection under uniform design live load indicated on the Contract Drawings shall not exceed  $1/360$  of the span.
2. Non-Composite Form Deck: Non-composite steel form deck shall not exceed the maximum construction span recommended by steel floor deck manufacturer under uniform design construction loads, including dead weight of wet concrete. Non-composite form deck deflection under uniform design live load shall not exceed  $1/240$  of the span.

### C. Attachments: Install and anchor floor deck units to provide lateral stability to top flange of supporting members.

### D. Sectional Properties: Determine in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members. Compute properties of steel deck section on the basis of the effective design width as limited by the provisions of the AISI Specification. Calculated section properties shall be certified by the Steel Deck Institute. Provide not less than the metal deck section properties of the

acceptable products specified, including section modulus and moment of inertia per foot of width.

#### 1.05 SUBMITTALS

##### A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:

1. Shop and Working Drawings: Submit detailed Shop Drawings and Working Drawings which indicate, for each type of floor decking required, material description, steel sheet thickness, product designation, surface finish, dimensional cross-sectional profile, and computed structural properties to verify compliance with the specified requirements. Drawings shall show details of fabrication and erection, including various connections, layouts of deck units, placement directions, bearing on structural supports, anchorage details, attachment of accessories, each condition requiring closure panels, supplementary framing, cut openings, special jointing and other accessories as required to complete the work. Details shall conform to SDI Standard Practice Details to the extent applicable. Details and layout shall show location of supporting members, quantity and marking of deck units, size and location of holes and openings to be cut, and the location, type and sequence of welded connections.
2. Review of Shop Drawings and Working Drawings will be for general considerations only. Compliance with specified requirements for materials, fabrication and erection of metal decking shall be the Contractor's responsibility.

##### B. Certifications

1. General: Test requirements for materials as stated herein or incorporated in reference documents may be waived, provided that certified copies of test reports from approved laboratories performed on previously manufactured material are submitted for approval.
2. Manufacturer's Certifications: Submit manufacturer's certifications as may be required to show compliance with these specifications. Submit copies of mill test reports, including names and locations of mills and shops, covering the chemical and physical properties of the steel sheet to show compliance with these specifications. Test reports shall be accompanied by notarized certificates of compliance from the manufacturer certifying that the previously tested material is of the same type, quality and manufacture as that proposed for this project.
3. Certification of Welders: Provide certification that each welder has been qualified in accordance with ANSI/AWS D1.1 within the previous 12-month period.

- C. **Manufacturer's Data:** Submit manufacturer's specifications and installation instructions for each type of decking and accessory required, including sheet steel, floor deck units, galvanized mill finish, finish repair paint, welding electrodes, welding washers if proposed, fasteners, closure strips, cover plates, and similar items.
- D. **Qualifications Compliance:** Submit references and project information to demonstrate the proposed steel floor deck manufacturer and installation contractor's specialized experience on similar projects of comparable scope and complexity for a minimum of three years.
- E. Submit project-specific safety precautions proposed to prevent falls and provide fall protection during erection of steel floor deck.

#### 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. **Testing and Inspection**
  - 1. Welding of steel floor deck to structural steel framing shall be subject to special inspection in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
  - 2. **Special Inspections**
    - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
    - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related



costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.

- c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- C. Qualification of Manufacturer: Steel floor and form deck units and accessories shall be provided where indicated on the Contract Drawings and shall be the products of a single manufacturer who is regularly engaged in the manufacture of steel floor and form decking.
- D. Qualification of Installer: Steel floor and form deck units and accessories shall be installed by a reputable company specialized in such work with a minimum of three years of documented experience.
- E. Qualification of Welders: Each welder shall be currently qualified in accordance with ANSI/AWS D1.1. All welders performing work within city limits shall be certified by the City of New York in accordance with the latest rules of the New York City Board of Standards and Appeals and the current provisions of the New York City Building Code, Local Law 76/2008. A welder shall be retested and recertified when the welder certification is more than 12 months old and/or when the work of the welder creates a reasonable doubt as to proficiency. Such tests, when required, shall be conducted at no additional expense to the City of New York. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.
- F. Design floor deck layout, spans, fastening, joints and framed openings under the direct supervision of a licensed Professional Engineer registered in the State of New York and experienced in the structural design of steel decking.
- G. Testing and Inspection: Material and fabrication procedures are subject to inspection and tests in the mill, shop and field by the Commissioner. Such inspection and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- H. Factory Inspection: Except as specified otherwise in this paragraph, factory tests and inspections of materials for which inspections and tests are specified herein, or in referenced documents, will not be required provided that certified copies of factory test reports, which shall include manufacturer's certificates of compliance with all requirements of these specifications, are submitted to and approved by the

Commissioner. When the test reports are on materials previously manufactured, test reports shall be accompanied by notarized statements from the manufacturer certifying that the materials being furnished are identical with previously manufactured materials on which the factory test reports are based.

- I. Shop and Working Drawing Reviews: Obtain such reviews before custom fabrication is started and before delivery of materials to the project site.
  - J. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
  - K. Site Safety
    - 1. Accept total responsibility for floor deck erection procedures and health and safety of the work force.
    - 2. Comply fully with OSHA workplace safety requirements and regulations and those of other authorities having jurisdiction.
    - 3. Provide and maintain OSHA-approved fall protection during erection of composite and non-composite floor decking.
  - L. Responsibility for Errors: Accept responsibility for errors of detailing and fabrication and for the correct fit of the floor deck units.
  - M. Remedial Action: Promptly remove and replace materials, fabrications and workmanship found defective and provide new acceptable work in accordance with contract requirements at no additional expense to the City of New York.
- 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Delivery: Deliver materials to the site in an undamaged condition and at such intervals as will avoid delay in the work.
  - B. Storage: Store and protect material in a clean, properly drained location. Store material off the ground under a weather-tight covering permitting good air circulation. Store decking on dry wood sleepers, pallets, platforms or other appropriate supports; slope for positive drainage. Prevent distortion, excessive stresses, corrosion and other damage.
    - 1. Caution: Do not store materials on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.
    - 2. Decking that is on-site but not yet installed shall be securely fastened to prevent sheets from becoming air-borne during periods of high wind and potentially causing damage or injury.

- C. Handling: Handle material safely and in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting.

## 1.08 PROJECT CONDITIONS

### A. Field Measurements

1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
2. Take sufficient field measurements prior to preparation of Shop and Working Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.
3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Galvanized Sheet Steel (for steel deck units): Provide sheet steel for galvanized metal deck units that conforms to ASTM A653 and ASTM A924, SQ Quality, Grade 33. Provide zinc-coated finish on both sides of deck that conforms to G90 Coating (0.90 ounces per square foot minimum total coating on both surfaces).
- B. Closure Strips or Plates, Metal: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 20 gauge, except as otherwise indicated.
- C. Cover Plates, Metal: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 20 gauge (but not less than the metal deck thickness), except as otherwise indicated.
- D. Welding Washers: Standard type compatible with decking furnished.
- E. Sheet Metal Accessories: ASTM A653, zinc-coated, G90 coating, Grade 33, commercial quality, of thickness indicated or as suitable for use intended.

- F. Galvanizing Repair Paint: High zinc-dust/zinc oxide content paint for repair of damaged galvanized surfaces and field touch-up of welds that meets the following requirements:
1. One application shall provide a minimum dry coating thickness of 2.0 mils.
  2. Dried film shall have a minimum zinc dust content equal to 94% by weight.
  3. The applied coating shall provide barrier protection and be anodic to steel.
  4. The coating may be applied under both shop and field conditions.
  5. The product used shall be approved by the galvanizer and shall be compatible with the galvanized surfaces and inert in concrete.

## 2.02 FABRICATION

- A. General: Deck units shall be manufactured in lengths to span three or more supports, where possible, with flush, telescoped or nested 2-inch end laps and nested side laps, unless otherwise indicated. End laps shall occur over supports. Deck configurations shall comply with SDI requirements and as specified herein.
- B. Composite Steel Floor Deck
1. Floor Deck Units
    - a. Provide galvanized composite steel floor deck units, where indicated on the Contract Drawings, which conform to the requirements specified herein.
    - b. Composite floor deck units shall be formed to provide a fluted profile and conform to the depth, metal thickness or gauge, and minimum section properties for each type of floor deck indicated on the Contract Drawings. Ribs shall be spaced at approximately 6 inches on centers, with integral embossing or raised patterns to provide mechanical bond with the concrete slab. Side laps shall be fabricated with lock seam joints.
    - c. Provide not less than the composite floor deck section properties of the acceptable products specified below, including section modulus and moment of inertia per foot of width.

2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Type B-LOK; United Steel Deck, Inc.; South Plainfield, NJ
  - b. Type 1.5VL; Vulcraft Corporation; Florence, SC
  - c. Or approved equal
- C. Non-Composite Steel Form Deck
  1. Form Deck Units
    - a. Provide galvanized non-composite steel form deck units, where indicated on the Contract Drawings, which conform to the requirements specified herein.
    - b. Non-composite steel form deck units shall be formed to provide a fluted profile and conform to the depth and of metal thickness or gauge indicated on the Contract Drawings. Ribs shall be spaced at approximately 4 inches on centers. Side laps shall be fabricated with lock seam joints.
  2. Products (for 7/8-inch or one-inch deep form deck profile): Subject to compliance with requirements, provide one of the following:
    - a. Type 1.OC, Vulcraft Corporation; Florence, SC
    - b. CSV Conform, Vulcraft Corporation; Florence, SC
    - c. HD Deck, Dacs, Inc., Portsmouth, VA
    - d. Or approved equal
- D. Cast-in-Place Concrete Fill for Composite Floor Deck: Where indicated on the Contract Drawings, provide normal weight concrete or structural lightweight concrete, as applicable, with maximum 3/4-inch diameter coarse aggregate as specified under Section 03300 - Cast-in-Place Concrete.
- E. Concrete Reinforcement: Uncoated welded wire fabric of the size and spacing indicated on the Contract Drawings and as specified under Section 03200 - Concrete Reinforcement.
- F. Formed Metal Closure Strips: Fabricate metal closure strips of not less than 20 gauge galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.
- G. Cleaning of Deck: Finished galvanized deck shall be thoroughly cleaned in a chemical bath, followed by a rinse, phosphatised, rinsed, dried and properly prepared for painting where required. Oiling of deck will not be allowed.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. General: Examine the areas and conditions under which steel deck is to be installed and notify the Commissioner promptly in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until disputed conditions, discrepancies and/or damages have been corrected, unless otherwise directed by the Commissioner.

### 3.02 INSTALLATION

- A. General
  - 1. Install composite steel floor deck units and non-composite steel form deck units in accordance with SDI Design Manual, as detailed on the approved shop drawings and as specified herein.
  - 2. Perform welding in conformance with ANSI/AWS D1.1.
  - 3. Coordinate deck bundles with structural steel erector in locating decking bundles to prevent overloading of structural members.
- B. Placing of Deck Units: Place deck units on supporting framework with edges up and flutes at right angles to supports. Adjust decking to final position with ends bearing not less than 3 inches on supporting members. Ensure that decking ends are accurately aligned and level on supports before being permanently fastened. Lap ends not less than two inches for welded construction of floor decking. Side laps shall be one-half corrugation. Do not stretch or contract the side lap interlocks. Place deck units flat and square and secured to adjacent framing without warp or excessive deflection and with close alignment between cells at ends of abutting deck units. Tape joints at all end laps to prevent concrete leakage.
- C. Cutting and Framing: Cut and fit floor deck units and accessories around other work projecting through or adjacent to the floor decking, as shown on the Contract Drawings. Provide neat, square and trim cuts.
- D. Welding: Permanently fasten metal deck units at ends and intermediate supports of steel supporting members by not less than 5/8-inch diameter fusion (puddle) welds or elongated welds of equal strength at maximum 12 inches on centers. Use welding washers where recommended by the deck manufacturer. Comply with ANSI/AWS requirements and procedures for manual shielded metal-arc welding, appearance, quality of welds and methods used in correcting welding work. The ambient temperature when the welding is performed shall be 35 degrees F. or higher. Weld metal accessories in place. Welds shall be free of cracks, craters and other defects. Units with burned holes or any other damage shall be replaced promptly with satisfactory units at no additional cost to the City of New York.

- E. Attachments: Fasten steel deck units to supporting members to resist lateral loads as indicated on the Contract Drawings in accordance with the SDI "Diaphragm Design Manual". In no case shall the fastening requirements be less than the following:
1. End Laps and Ends Terminating at Supports: Fasten using a weld washer at each side lap plus one intermediate weld (4 welds per 3-foot wide sheet) unless otherwise recommended by manufacturer.
  2. Intermediate Supports: Weld each sheet at each intermediate support not less than 12 inches on centers and at closer spacing where required for lateral force resistance as indicated on the Contract Drawings, unless otherwise recommended by manufacturer.
  3. Side Laps: Lock side laps between adjacent deck units at intervals not exceeding 24 inches on centers or half the span between supports, whichever is less, by tack welding, button punching or mechanical fasteners, unless otherwise indicated on the Contract Drawings. Weld side laps only on decking 18 gauge and heavier. Verify male/female joint is nested prior to fastening.
- F. Closure Strips, Metal: Provide metal closure strips at all open uncovered ends and edges of decking and in the voids between decking and other construction. Weld into upturned position to thickness of slab to contain wet concrete unless otherwise detailed. The closures shall be sufficient to remain stationary without distortion.
- G. Cover Plates: Provide metal joint covers at abutting ends of deck units, except where taped joints are required or permitted.
- H. Reinforcement at Openings
1. Provide additional steel reinforcement and closure pieces required for strength, continuity of decking, and support of other work, unless otherwise specified or shown on the Contract Drawings.
  2. Reinforce decking around openings less than 6 inches in any dimension by means of a steel sheet of the same profile as the deck placed over the opening and fusion welded to the top surface of the deck. Provide steel sheet of the same quality as the deck units, not less than 18 gauge and at least 14 inches wider and longer than the opening. Provide welds at each corner and spaced not more than 6 inches on centers along each side.
  3. Reinforce deck openings from 6 to 14 inches in each dimension with ASTM A36 steel angles on each side of the opening where framing is not shown on the Contract Drawings. The design of the framing angles shall be based on the design load of the applicable floor area and in no case shall the angles be less than 3x3x3/8 steel angles. Connect the angles parallel to the deck span to

structural steel floor framing and to the other two angles along the sides of the opening by welding. Anchor the angles to the deck by welding as required. Bolted and welded connections for supplemental framing angles shall meet the requirements of Section 05120 – Structural Steel.

4. Reinforce openings larger than 14 inches in any dimension in accordance with details indicated on the Contract Drawings.
  - I. Install 10 gauge minimum sheet steel end closure screeds at floor edge, upturned to thickness of slab, to contain wet concrete unless otherwise detailed. Provide closures of sufficient strength to remain stationary without distortion.
  - J. Install sheet steel end closure screeds to close openings between deck, walls, columns, and floor penetrations unless otherwise detailed on the Contract Drawings.
  - K. Clean surfaces of steel deck and accessories to receive concrete of all debris and foreign matter prior to installing welded wire fabric and placing concrete fill.
  - L. Touch-Up Galvanizing Repair Paint: Immediately after completion of installation, wire brush exposed surfaces of deck in accordance with SSPC-SP-2, Hand Tool Cleaning. Clean and touch-up decking and accessories, where field cut, welded, burned or otherwise damaged with approved galvanizing repair paint as provided by the manufacturer, applied in accordance with manufacturer's instructions. Spot repairs to galvanized finish shall be made where required at no cost to the City of New York.

### 3.03 PROTECTION

- A. During installation, do not use the floor decking as a storage platform nor as a working platform until the deck units have been permanently fastened in position.
- B. Do not overload the surface of installed floor decking during entire construction period.
- C. Do not suspend mechanical equipment or other loads, either temporarily or permanently, from steel decking unless otherwise shown or permitted and, in no case, until the deck units have been permanently fastened in position.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 05312**  
**STEEL ROOF DECK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install steel roof decking and appurtenant items, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. Roof deck units are required for exterior building roof and roof and vertical walls of the roof monitors.
- C. This section includes, but is not limited to, the following items:
  - 1. Steel Roof Deck Units
  - 2. Galvanized Finish
  - 3. Formed Metal Closure Strips or Plates
  - 4. Formed Metal Cover Plates
  - 5. Welding Washers
  - 6. Sheet Metal Accessories
  - 7. Ridge and Valley Plates
  - 8. Recessed Metal Roof Deck Pans
  - 9. Joint Sealant
  - 10. Galvanizing Repair Paint
- D. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- E. Composite and non-composite steel floor deck is not included in this Section, but is specified in Section 05311 – Steel Floor Deck.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 - Structural Steel
- B. Section 05311 - Steel Floor Deck

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Iron and Steel Institute (AISI)
  - a. AISI Specification for the Design of Cold-Formed Steel Structural Members
  - b. AISI Cold-Formed Steel Design Manual
2. American Society for Testing and Materials (ASTM)
  - a. ASTM A36, Carbon Structural Steel
  - b. ASTM A526, Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
  - c. ASTM A653, Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
  - d. ASTM A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
  - e. ASTM A924, General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
  - f. ASTM C920, Elastomeric Joint Sealants
3. American National Standards Institute/American Welding Society (ANSI/AWS)
  - a. ANSI/AWS D1.1, Structural Welding Code - Steel
  - b. ANSI/AWS D1.3, Structural Welding Code - Sheet Steel
4. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto.
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto.
5. Steel Deck Institute (SDI)
  - a. SDI Design Manual for Composite Decks, Form Decks and Roof Decks, Publication No. 30
  - b. SDI Diaphragm Design Manual, Second Edition, Publication DDM02
  - c. SDI Standard Practice Details, Publication SPD2

6. Society for Protective Coatings (SSPC), formerly Steel Structures Painting Council: SSPC-2, Hand Tool Cleaning

#### 1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. General: The Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks shall govern the work under this Section unless noted otherwise.
- B. Design Basis: The minimum depth, gauge and sectional properties of each type of steel roof deck required shall be as indicated on the Contract Drawings.
- C. Design Calculations: Provide manufacturer-certified structural calculations to verify that proposed steel roof deck meets minimum design requirements based on sectional properties calculated in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members. Coefficients for moments and deflections shall conform to the Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks.
- D. Deck units shall have a ribbed, non-cellular section providing a satisfactory surface for the reception of design loads. Wherever practicable, units shall be of sufficient length to span three or more supports.
- E. Allowable Deflection: Roof deck shall comply with Factory Mutual, Loss Prevention Data, I-28 recommendation, but maximum deflection shall not exceed  $1/240$  of the span under uniform design live load indicated on the Contract Drawings nor 200 pound concentrated load at mid-span on a one-foot wide section of deck during construction.
- F. Attachments: Install and anchor roof deck units to supporting members to provide lateral stability to top flange of supporting members and resist design horizontal and uplift loadings indicated on the Contract Drawings. Fastening requirements to resist horizontal loads shall be in accordance with SDI Diaphragm Design Manual.
- G. Sectional Properties: Determine in accordance with American Iron and Steel Institute Specification for the Design of Cold-Formed Steel Structural Members. Compute properties of steel roof deck section on the basis of the effective design width as limited by the provisions of the AISI Specifications. Calculated section properties shall be certified by the Steel Deck Institute. Provide not less than the metal deck section properties of the acceptable products/manufacturers specified, including section modulus and moment of inertia per foot of width.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:

1. Shop Drawings: Submit detailed shop drawings which indicate, for each type of steel roof decking required, material description, steel sheet thickness, product designation, surface finish, dimensional cross-sectional profile, and computed structural properties to verify compliance with project requirements. Drawings shall show details of fabrication and erection, including various connections, layouts of deck units, placement directions, bearing on structural supports, anchorage details, attachment of accessories, each condition requiring closure panels, supplementary framing, cut openings, special jointing and other accessories as required to complete the work. Details shall conform to SDI Standard Practice Details to the extent applicable. Details and layout shall show location of supporting members, quantity and marking of decking units, size and location of holes and openings to be cut and the location, type and sequence of welded connections.
2. Review of Shop Drawings and Working Drawings will be for general considerations only. Compliance with specified requirements for materials, fabrication and erection of metal decking shall be the Contractor's responsibility.

**B. Certifications**

1. General: Test requirements for materials as stated herein or incorporated in reference documents may be waived, provided that certified copies of test reports from approved laboratories performed on previously manufactured material are submitted.
2. Manufacturer's Certifications: Submit manufacturer's certifications as may be required to show compliance with these specifications. Submit copies of mill test reports, including names and locations of mills and shops, covering the chemical and physical properties of the steel sheet to show compliance with these specifications. Test reports shall be accompanied by notarized certificates of compliance from the manufacturer certifying that the previously tested material is of the same type, quality and manufacture as that proposed for this project.
3. Certification of Welders: Provide certification that each welder has been qualified in accordance with ANSI/AWS D1.1 within the previous 12-month period.

- C. Manufacturer's Data:** Submit manufacturer's specifications, test reports and installation instructions for each type of material, decking and accessory required, including sheet steel, steel roof deck units, galvanized mill finish, finish repair paint, welding electrodes, welding washers if proposed, mechanical fasteners, depressed metal roof deck pans, closure strips, cover plates, joint sealant and similar items.

- D. Qualifications Compliance: Submit references and project information to demonstrate the proposed steel roof deck manufacturer and installation contractor's specialized experience on similar projects of comparable scope and complexity for a minimum of three years.
- E. Submit project-specific safety precautions proposed to prevent falls and provide fall protection during erection of steel roof deck.

#### 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Testing and Inspection
  - 1. Welding of steel roof deck to structural steel framing shall be subject to controlled inspection in accordance with the requirements of the New York City Building Code, Local Law 76/2008 and the applicable Contract provisions. Special inspection and testing services required by the New York City Building Code, Local Law 76/2008 will be provided by the Special Inspector. Construction inspection and testing of work not regulated under special inspection but covered under this Section will be performed under the direction of the Commissioner.
  - 2. Special Inspections
    - a. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with 2008 New York City Construction Codes requirements or as additionally may be called for in the Specifications. The Special Inspector shall be an entity compliant with the requirements of the 2008 New York City Construction Codes.
    - b. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The Contractor shall be responsible for, and bear related costs, to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
    - c. Inspections and tests performed under Special Inspections shall not relieve the Contractor of the responsibility to comply with the Contract

Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under Special Inspections. Failure of a special inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

- C. Qualification of Manufacturer: Steel roof deck units and accessories shall be provided where indicated on the Contract Drawings and shall be the products of a single manufacturer who is regularly engaged in the manufacture of steel roof decking.
- D. Qualification of Installer: Steel roof deck units and accessories shall be installed by a reputable company specialized in such work with a minimum of three years of documented experience.
- E. Qualification of Welders: Each welder shall be currently qualified in accordance with ANSI/AWS D1.1. All welders performing work within the city limits shall be certified by the City of New York in accordance with the latest rules of the New York City Board of Standards and Appeals and the current provisions of the New York City Building Code, Local Law 76/2008. A welder shall be retested and recertified when the welder certification is more than 12 months old and/or when the work of the welder creates a reasonable doubt as to proficiency. Such tests, when required, shall be conducted at no additional expense to the City of New York. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.
- F. Design roof deck layout, spans, fastening, joints and framed openings under the direct supervision of a licensed Professional Engineer registered in the State of New York and experienced in the structural design of steel decking.
- G. Testing and Inspection: Material and fabrication procedures are subject to inspection and tests in the mill, shop and field by the Commissioner. Such inspection and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- H. Factory Inspection: Except as specified otherwise in this paragraph, factory tests and inspections of materials for which inspections and tests are specified herein, or in referenced documents, will not be required provided that certified copies of factory test reports, which shall include manufacturer's certificates of compliance with all requirements of these specifications, are submitted to and approved by the Commissioner. When the test reports are on materials previously manufactured, test reports shall be accompanied by notarized statements from the manufacturer certifying that the materials being furnished are identical with previously manufactured materials on which the factory test reports are based.

- I. Shop and Working Drawings Reviews: Obtain such reviews before custom fabrication is started and before delivery of materials to the project site.
- J. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- K. Site Safety
  - 1. Accept total responsibility for roof deck erection procedures and health and safety of the work force.
  - 2. Comply fully with OSHA workplace safety requirements and regulations and those of other authorities having jurisdiction.
  - 3. Provide and maintain OSHA-approved fall protection during erection of composite and non-composite floor decking.
- L. Responsibility for Errors: Accept responsibility for errors of detailing and fabrication and for the correct fit of the steel roof deck units.
- M. Remedial Action: Promptly remove and replace materials, fabrications and workmanship found defective and provide new acceptable work in accordance with contract requirements at no additional expense to the City of New York.

#### 1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to the site in an undamaged condition and at such intervals as will avoid delay in the work.
- B. Storage: Store and protect material in a clean, properly drained location. Store material off the ground under a weather-tight covering permitting good air circulation. Store decking on dry wood sleepers, pallets, platforms or other appropriate supports; slope for positive drainage. Prevent distortion, excessive stresses, corrosion and other damage.
  - 1. Caution: Do not store materials on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.
  - 2. Decking that is on-site but not yet installed shall be securely fastened to prevent sheets from becoming air-borne during periods of high wind and potentially causing damage or injury.
- C. Handling: Handle material safely and in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting.



## 1.08 PROJECT CONDITIONS

### A. Field Measurements

1. Prior to commencement of the work, field verify existing dimensions, elevations, locations and conditions applicable to the work. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner. Report variances and discrepancies from the Contract Drawings and potential interferences promptly to the Commissioner.
2. Take sufficient field measurements prior to preparation of Shop and Working Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, do not delay job progress. Allow for adjustments and fitting wherever the taking of field measurements before fabrication may not be possible or might delay the work.
3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. Perform the work to meet actual field conditions encountered.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Galvanized Sheet Steel (for steel deck units): Provide sheet steel for galvanized metal deck units that conforms to ASTM A653 and ASTM A924, zinc-coated, G90 coating, SQ Quality, Grade 33. Provide zinc-coated finish on both sides of deck that conforms to G90 coating (0.90 ounces per square foot minimum total coating on both surfaces).
- B. Closure Strips or Plates, Metal: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 20 gauge, except as otherwise indicated.
- C. Cover Plates, Metal: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 20 gauge (but not less than the metal deck thickness), except as otherwise indicated.
- D. Welding Washers: Standard type compatible with decking furnished.
- E. Sheet Metal Accessories: ASTM A526, commercial quality, galvanized, of thickness indicated or as suitable for use intended.
- F. Ridge and Valley Plates: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 20 gauge (but not less than the metal deck thickness), except as otherwise indicated.

- G. Recessed Metal Roof Deck Pans: ASTM A653, zinc-coated, G90 coating, SQ Quality, Grade 33, minimum 14 gauge (0.071 inch).
- H. Galvanizing Repair Paint: High zinc-dust/zinc oxide content paint for repair of damaged galvanized surfaces and field touch-up of welds that meets the following requirements:
1. One application shall provide a minimum dry coating thickness of 2.0 mils.
  2. Dried film shall have a minimum zinc dust content equal to 94% by weight.
  3. The applied coating shall provide barrier protection and be anodic to steel.
  4. The coating may be applied under both shop and field conditions.
  5. The product used shall be approved by the galvanizer and shall be compatible with the galvanized surfaces and inert in concrete.
- I. Joint Sealant: One-part, moisture-cured, polyurethane base, non-sag, gun-grade, elastomeric sealant meeting the requirements of Federal Specification TT-S-00230C, Type II, Class A and ASTM C920, Type S, Grade NS, Class 25. Acceptable products and manufacturers: Subject to compliance with requirements, provide one of the following:
1. Sikaflex-1a; Sika Corporation, Lyndhurst, NJ
  2. Eucolastic; Euclid Chemical Company, Cleveland, OH
  3. Sonolastic NP-1; BASF Construction Chemicals - Building Systems, Shakopee, MN
  4. Or approved equal

## 2.02 FABRICATION

- A. General: Deck units shall be manufactured in lengths to span three or more supports, where possible, with flush, telescoped or nested 2-inch end laps and nested side laps, unless otherwise indicated. End laps shall occur over supports. Deck configurations shall comply with SDI requirements and as specified herein.
- B. Metal Roof Deck
1. Roof Deck Units: Shall be manufactured from mill coated, extra heavy duty galvanized sheet steel conforming to ASTM A653 and A924. Configuration of roof deck units shall be formed to provide a fluted profile and conform to the depth, metal thickness or gauge, and sectional properties indicated on the Contract Drawings.

- a. Main Roof: Shall conform to standard SDI deep-rib fluted profile, approximately 3 inches in depth, minimum metal thickness of 20 gauge and ribs spaced at approximately 8 inches on center unless otherwise indicated on the Contract Drawings. Width of rib opening at top shall be not more than 2-3/4 inches; width of bottom rib surface shall be not less than 1-1/2 inches.
  - b. Roof Eave and Monitor Walls: Shall conform to standard SDI fluted profile, approximately 1-1/2 inches in depth, minimum metal thickness of 20 gauge, unless otherwise indicated on the Contract Drawings. Ribs shall be spaced at approximately 6 inches on center. Width of rib opening at top shall be not more than 2-1/2 inches; width of bottom rib surface shall be not less than 1-1/2 inches.
2. Provide not less than the roof deck section properties of the acceptable products/manufacturers specified below, including section modulus and moment of inertia per foot of width.
  3. Acceptable Products/Manufacturers: Subject to compliance with requirements, provide one of the following:
    - a. Main Roof
      - (1) Type NS; United Steel Deck, Inc.; South Plainfield, NJ
      - (2) Type 3N; Vulcraft Corporation; Florence, SC
      - (3) Or approved equal
    - b. Roof Eave and Monitor Walls
      - (1) Type B; United Steel Deck, Inc.; South Plainfield, NJ
      - (2) Type B; Vulcraft Corporation; Florence, SC
      - (3) Or approved equal
- C. Formed Steel Closure Strips: Fabricate metal closure strips of not less than 20 gauge galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.
  - D. Ridge and Valley Plates: Fabricate ridge and valley plates of galvanized sheet steel of the same quality as the deck units with each leg not less than 2-1/4 inches wide, bent to provide tight-fitting closure with deck units. Provide plates in 10-foot lengths where possible.
  - E. Recessed Roof Deck Pans: Shall be recessed type fabricated from a single piece of not less than 14 gauge galvanized sheet steel of the same quality as the deck units, with level bottoms and sloping sides to direct water flow to the drain, unless otherwise shown. Provide deck pans of adequate size to receive roof drains, at least

2'-0" by 2'-0", and with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below the roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains shall be cut in the field.

- F. Cleaning of Deck: Finished galvanized deck shall be thoroughly cleaned in a chemical bath, followed by a rinse, phosphatised, rinsed, dried and properly prepared for painting where required. Oiling of deck will not be allowed.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. General: Examine the areas and conditions under which steel roof deck is to be installed and notify the Commissioner promptly in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until disputed conditions, discrepancies and/or damages have been corrected, unless otherwise directed by the Commissioner.

### 3.02 INSTALLATION

#### A. Steel Roof Deck

1. General: Finished roof decking shall be flat and suitable for application of insulation thereupon.
  - a. Criteria: Install deck units and accessories in accordance with manufacturer's recommendations, approved Shop Drawings and as specified herein.
  - b. Deck Bundles: Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
  - c. Deck Storage: Do not use deck units for storage or working platform until permanently secured.
2. Placing of Deck Units: Place deck units on supporting steel framework with edges up and flutes at right angles to supports. Adjust to final position with ends bearing on supporting members not less than 3 inches and accurately aligned end to end before being permanently fastened. Lap ends not less than 2 inches for welded construction of all roof decks. Side laps shall be one-half corrugation. Do not stretch or contract the side lap interlocks. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection and with close alignment between cells at ends of abutting deck units.

3. Cutting and Framing: Cut and fit roof deck units and accessories around other work projecting through or adjacent to the roof decking, as shown on the Contract Drawings. Provide neat, square and trim cuts.
4. Welding: Permanently fasten metal deck units to steel supporting members by not less than 5/8-inch-diameter fusion (puddle) welds or elongated welds of equal strength. Use welding washers where recommended by the deck manufacturer. Comply with ANSI/AWS requirements and procedures for manual shielded metal-arc welding, appearance, quality and methods used in correcting welding work. The ambient temperature when the welding is performed shall be 35 degrees F. or higher. Welds shall be free of cracks, craters and other defects. Units with burned holes or any other damage shall be replaced promptly with satisfactory units at no additional cost to the City of New York. Metal accessories shall be securely welded in place.
5. Attachments: Install and anchor roof deck units to supporting members to provide lateral stability to top flange of supporting members and resist design horizontal and uplift loadings indicated on the Contract Drawings if applicable. In no case shall the fastening requirements be less stringent than the following:
  - a. End Laps and Ends Terminating at Supports: End laps and all edge supports shall be fastened at 6 inches on center unless otherwise recommended by manufacturer.
  - b. Intermediate Supports: Each sheet shall be welded at each intermediate support not less than 12 inches on centers and at closer spacing where required for lateral force resistance, unless otherwise recommended by manufacturer.
  - c. Side Laps: Lock side laps between adjacent deck units at intervals not exceeding 36 inches on centers by tack welding, button punching or mechanical fasteners, unless otherwise recommended by the manufacturer. Weld side laps only on decking 18 gauge and heavier.
6. Formed Steel Closure Strips: Provide metal closure strips at all open uncovered ends and edges of roof decking and in the voids between decking and other construction. Weld into position to provide a complete decking installation.
7. Cover Plates: Provide metal joint covers at abutting ends of deck units, except where taped joints are required or permitted.

8. Reinforcement at Openings
    - a. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work, unless otherwise shown or specified.
    - b. Reinforce roof decking around openings less than 6 inches in any dimension by means of a flat steel sheet placed over the opening and fusion welded to the top surface of the deck. Provide steel sheet of the same quality as the deck units, not less than 18 gauge and at least 12 inches wider and longer than the opening. Provide welds at each corner and spaced not more than 6 inches on centers along each side.
    - c. Reinforce deck openings larger than 6 inches in any dimension with ASTM A36 steel angles on each side of the opening where framing is not shown on the Contract Drawings. The design of the framing angles shall be based on the design load of the applicable floor area and in no case shall the angles be less than 3x3x3/8 steel angles. Connect the angles parallel to the deck span to structural steel floor framing and to the other two angles along the sides of the opening by welding. Anchor the angles to the deck by welding as required. Bolted and welded connections for supplemental framing angles shall meet the requirements of Section 05120 – Structural Steel.
  9. Roof Insulation Support: Provide metal closure strips for the support of roof insulation where the rib openings in the top surface of roof decking occur adjacent to edges and openings. Weld closure strips into position.
  10. Ridge and Valley Plates: Weld ridge and valley plates to the top surface of the roof decking. Lap end joints not less than 3 inches with laps made in the direction of water flow.
  11. Recessed Roof Deck Pans: Place roof deck pans over openings provided in the roof decking. Position pans with flanges bearing on top surface of deck and weld to the top deck surface. Fusion weld at each deck flute with at least one weld at each corner. Cut openings in the bottom of the roof deck pan to accommodate the drain size required.
- B. Touch-Up Galvanizing Repair Paint: Immediately after completion of installation, wire brush deck in accordance with SSPC-SP-2, Hand Tool Cleaning. Clean and touch-up decking and accessories, where field cut, welded, burned or otherwise damaged with approved galvanizing repair paint as provided by the manufacturer, applied in accordance with manufacturer's instructions. Spot repairs to galvanized finish shall be made where required in accordance with ASTM A780 at no cost to the City of New York.

3.03 PROTECTION

- A. During installation, do not use the steel roof decking as a storage platform nor as a working platform until the deck units have been permanently fastened in position.
- B. Do not overload the surface of installed steel roof decking during entire construction period.
- C. Do not suspend mechanical equipment or other loads, either temporarily or permanently, from steel roof decking unless otherwise detailed or permitted and, in no case, until the deck units have been permanently fastened in position.

-END OF SECTION-

**Section 05400**  
**COLD FORMED METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install cold-formed metal framing and appurtenant items, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. This Section includes, but is not limited to, the following items:
  - 1. Metal Framing
  - 2. Galvanized Finish
  - 3. Steel Runners (Track)
  - 4. Blocking
  - 5. Lintels
  - 6. Fasteners and Accessories
- C. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- D. Metal framing for certain applications is specified in Section 05500 – Metal Fabrications.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05500 – Metal Fabrications
- B. Section 09265 – Gypsum Board Assemblies

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Iron and Steel Institute (AISI)
    - a. AISI Specification for the Design of Cold-Formed Steel Structural Members



2. American Society for Testing and Materials (ASTM)
  - a. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - b. ASTM A568 - Steel, Sheet, Carbon and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled
  - c. ASTM A570 - Steel Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
  - d. ASTM A611 - Steel, Sheet, Carbon, Cold-Rolled, Structural Quality
  - e. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - f. ASTM C645 - Nonstructural Steel Framing Members
  - g. ASTM C955 - Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
3. City of New York
  - a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals, latest edition and amendments or supplements thereto

#### 1.04 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  1. Manufacturer's data sheets and erection instruction for each item specified.
  2. Working Drawings and Shop Drawings including layout and installation drawings for load-bearing framing members showing size and gauge designations, number, type, location, and spacing.
  3. Drawings indicating supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.
  4. Samples of all framing components and fasteners.

- B. Review of Shop Drawings and Working Drawings will be for general considerations only. Compliance with specified requirements for materials, fabrication and installation of cold-formed metal framing shall be the Contractor's responsibility.

#### 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. All metal framing assemblies shall be inspected and approved by the Commissioner prior to application of finish materials. Assemblies not approved shall be replaced with new material at no additional expense to the City of New York.
- C. All defective, damaged or substandard quality work will be rejected and replaced with new work in accordance with the provisions of the Contract Documents at no additional expense to the City of New York.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type, and grade.
- B. Store materials off ground in a dry ventilated space or protect with waterproof tarpaulins that permit the movement of water vapor, so as not to create a humidity chamber.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. For 16-gauge and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi, conforming to ASTM A570, A611 or A653.
- B. For 18-gauge and lighter units, fabricate metal framing of commercial quality steel sheet with a minimum yield point of 33,000 psi, conforming to ASTM A570, A611 or A653.
- C. Provide steel runners (track), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories in accordance with manufacturer's recommendations for applications indicated on the Contract Drawings, and as needed to provide a complete metal framing system.
- D. Provide studs, tracks, etc. that conform to ASTM C955.

- E. Provide galvanized finish of metal framing components in accordance with ASTM A123 and ASTM A653.
- F. Where framing units are components of assemblies indicated for a fire-resistance rating, provide units that have been approved by authorities having jurisdiction. Coordinate metal framing with Section 09265 – Gypsum Board Assemblies.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Examine all Contract Drawings covering the work of this Section, and refer to all other Contract Drawings which may affect this work or require coordination by this trade.
- B. Execution of work of this trade constitutes acceptance of adjoining work and other conditions as being satisfactory in every respect. Later claims of defects in such cases will not constitute relief in any way from the requirements of these Specifications.

### 3.02 FABRICATION

- A. Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion. Fabricate panel to a maximum allowable tolerance variation plumb, level, and true to line of 1/8 inch in 10 feet.
- B. Attach similar components by welding. Attach dissimilar components by welding, bolting or screw fasteners, as standard with manufacturer. Wire tying of framing is not permitted. Repair galvanized surfaces damaged by welding with zinc rich paint.

### 3.03 INSTALLATION

- A. Install metal framing system in accordance with manufacturer's printed instructions and recommendations.
- B. Install continuous tracks sized to match studs. Align tracks accurately to layout base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches. Provide fasteners at corners and end of track.
- C. Set studs plumb where stud system abuts columns or walls, anchor ends of stiffeners to supporting structure.
- D. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services,

case work, heavy trim and furnishings, and similar work requiring attachment to wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards, considering weight or loading resulting from each item supported.

- E. Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
- F. Frame openings larger than 2 feet wide with double studs at each jamb, unless additional framing is indicated on the Contract Drawings, or indicated by manufacturer's instructions.
- G. Provide load-bearing headers at each opening.
- H. Install horizontal stiffeners in stud system, spaced vertically at not more than 4'-6" on center. Weld at each intersection.
- I. Install joists level and plumb, complete with bracing and reinforcing recommended by manufacturer.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 05500**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

**A. Section includes:**

1. Steel framing and supports for ceiling-hung toilet compartments
2. Steel framing and supports for overhead doors
3. Steel framing and supports for countertops
4. Steel framing and supports for mechanical and electrical equipment
5. Steel framing and supports for applications where framing and supports are not specified in other Sections
6. Loose bearing and leveling plates
7. Steel weld plates and angles for casting into concrete not specified in other Sections
8. Miscellaneous steel trim including steel angle corner guards and steel edgings
9. Fixed metal ladders
10. Ladder safety cages
11. Metal bollards
12. Stair nosings

**B. Products furnished, but not installed, under this Section include the following:**

1. Loose steel lintels
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry
3. Stair nosings at reinforced concrete stairs

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete, for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.**

- B. Section 04201 - Unit Masonry, for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry
- C. Section 05120 - Structural Steel
- D. Section 05511 - Exterior Metal Stairs
- E. Section 05512 - Interior Metal Stairs
- F. Section 05521 - Exterior Pipe and Tube Railings (Stainless Steel)
- G. Section 05522 - Interior Pipe and Tube Railings (Stainless Steel)
- H. Section 06100 - Rough Carpentry
- I. Section 06400 - Architectural Woodwork/Casework
- J. Section 08331 - Overhead Coiling Doors
- K. Section 08342 - Overhead High Speed Fabric Doors
- L. Section 09911 - Exterior Painting
- M. Section 09912 - Interior Painting
- N. Section 09967 - Coatings for Steel Waterfront Structures

### 1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base Engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces

### 1.04 SUBMITTALS

- A. Product Data: For the following:
  - 1. Grout

- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items and adjacent conditions.
  - 2. Provide templates for anchors and bolts specified for installation under other Sections.
  - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified New York State licensed Professional Engineer responsible for their preparation.
- C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- D. Welding certificates
- E. Qualification Data: For professional Engineer

#### 1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel"
  - 2. AWS D1.3, "Structural Welding Code--Sheet Steel"
  - 3. AWS D1.6, "Structural Welding Code--Stainless Steel"

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

#### 1.07 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.



- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers or products specified.

### 2.02 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.03 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316L
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L
- D. Rolled-Stainless-Steel Floor Plate: ASTM A 793
- E. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallurgically bonded to steel by a proprietary process
  - 1. IKG Industries, a Harsco company; Mebac
  - 2. W. S. Molnar Company; SlipNOT
- F. Steel Tubing: ASTM A500, cold-formed steel tubing
- G. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads
- H. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches unless otherwise indicated
  - 2. Material: Galvanized steel complying with ASTM A653, structural steel, Grade 33, with G90 coating; 0.064-inch nominal thickness unless another weight is indicated or required by structural loads

- I. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads

## 2.04 STAIR NOSINGS

- A. Cast-Metal Units: Cast aluminum with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.

1. Manufacturers:

- a. American Safety Tread Co., Inc.
    - b. Balco Inc.
    - c. Barry Pattern & Foundry Co., Inc.
    - d. Granite State Casting Co.
    - e. Safe-T-Metal Co.
    - f. Wooster Products Inc.
    - g. Or approved equal

2. Configuration: Cross-hatched angle-shaped units, same depth as bar-grating treads and 1 to 1½ inches wide.

- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed bottoms, sides, and edges of extruded units set into concrete.

## 2.05 FASTENERS

- A. Unless otherwise indicated, provide Type 316 stainless-steel fasteners. Comply with ASTM B633. Select fasteners for type, grade, and class required.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 59 for bolts and ASTM F 594 for nuts, Alloy Group 2 (A4)
- C. Anchor Bolts: ASTM F 1554, Grade 36
  1. Provide hot-dip galvanized anchor bolts where item being fastened is indicated to be galvanized.
- D. Lag Bolts: ASME B18.2.1
- E. Plain Washers: Round, ASME B18.22.1

- F. Lock Washers: Helical, spring type, ASME B18.21.1
- G. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153.
- H. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
  - 1. Material for Anchors: Alloy Group 2 (A4) stainless steel bolts complying with ASTM F593 and nuts complying with ASTM F594

## 2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 09967 - Coatings for Steel Waterfront Structures.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete Materials and Properties for bollards and wheel guards: Comply with requirements in Section 03300 - Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

## 2.07 FABRICATION

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
  - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches on center., unless otherwise indicated.

## 2.08 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

- C. Galvanize miscellaneous framing and supports.

## 2.09 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
- C. Galvanize loose steel lintels.

## 2.010 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

## 2.11 STEEL TRIM

- A. Unless otherwise indicated, fabricate units from Type 316L stainless steel shapes, plates, and bars with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded stainless steel strap anchors for embedding in concrete or masonry construction.

## 2.12 METAL LADDERS

- A. Comply with ANSI A14.3, unless otherwise indicated.
- B. Space siderails minimum 16 inches apart, unless otherwise indicated.
- C. Support each ladder at top and bottom and not more than 60 inches on center with welded or bolted brackets, made from same metal as ladder.

**D. Steel Ladders**

1. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges
2. Rungs: 1-inch- diameter or 1-inch- square steel bars
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
6. Products
  - a. IKG Industries, a Harsco company; Mebac
  - b. W. S. Molnar Company; SlipNOT
  - c. Or approved equal
7. Galvanize ladders, including brackets and fasteners

**2.13 LADDER SAFETY CAGES**

- A. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
- B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet on center. Provide secondary intermediate hoops spaced not more than 48 inches on center between primary hoops.
- C. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners, unless otherwise indicated.
- D. Steel Ladder Safety Cages
  1. Primary Hoops: 1/4-by-4-inch flat bar hoops
  2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops
  3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop
- E. Galvanize ladder cages including fasteners

**2.14 METAL BOLLARDS**

- A. Fabricate metal bollards from Schedule 80 steel pipe.

## 2.15 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## 2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items to comply with applicable standard listed below:
  - 1. ASTM A123, for galvanizing steel and iron products
  - 2. ASTM A153/A, for galvanizing steel and iron hardware

## 2.17 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Dull Satin Finish: No. 6.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

# PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
  - D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
  - E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- 3.02 MISCELLANEOUS FRAMING AND SUPPORTS
- A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- 3.03 BEARING AND LEVELING PLATES
- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
  - B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
    1. Use non-shrink grout, either metallic or non-metallic, in concealed locations where not exposed to moisture; use non-shrink, non-metallic grout in exposed locations, unless otherwise indicated.
    2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- 3.04 PIPE BOLLARDS
- A. Anchor bollards in place with studs attached to embedded weld-plate anchored to concrete footings.
  - B. Fill bollards solidly with concrete and install cap.
- 3.05 ADJUSTING AND CLEANING
- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.



- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

-END OF SECTION-

**Section 05511**  
**EXTERIOR METAL STAIRS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes industrial-type exterior stainless steel stairs with stainless steel grating type treads, landings and platforms.

**1.02 RELATED SPECIFICATIONS**

1. Section 03300 – Cast-in-Place Concrete
2. Section 05120 – Structural Steel
3. Section 05500 - Metal Fabrications
4. Section 05521 - Exterior Pipe and Tube Railings
5. Section 06100 - Rough Carpentry

**1.03 SUBMITTALS**

- A. Product Data: For metal stairs and the following:
1. Ferrous and non-ferrous metals
  2. Grout
  3. Engineering calculations
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Welding certificates.
- D. Qualification Data: For testing agency.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
1. Test railings according ASTM E 894 and ASTM E 935.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Fabricator of products.
- B. NYC Building Code: Comply with applicable requirements for stair design, structural loading and railings.

- C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

- 1. Industrial-Type Stairs: Industrial class.

- D. Welding: Qualify procedures and personnel according to the following:

- 1. AWS D1.6, "Structural Welding Code - Stainless Steel."

- E. Engineering Calculations: Provide engineering calculations certified by a qualified NYS Professional Engineer demonstrating compliance with structural loading and performance or as indicated.

#### 1.05 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

### PART 2 PRODUCTS

#### 2.01 METALS, GENERAL

- A. Metal Surfaces: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

#### 2.02 FERROUS METALS

- A. Stainless Steel Plates, Shapes and Bars: ASTM A 666, Type 316.
- B. Stainless Steel Tubing: ASTM A 554, Grade MT 316.

#### 2.03 STAINLESS STEEL FASTENERS

- A. General: Provide stainless steel fasteners fabricated from Type 316 alloy. Select fasteners for type, grade, and class required.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 2.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
  - 1. Provide Type 316 stainless steel anchor bolts.

- D. Machine Screws: ASME B18.6.3.
  - 1. Provide Type 316 stainless steel machine screws.
- E. Plain Washers: Round, ASME B18.22.1.
  - 1. Provide Type 316 stainless steel washers.
- F. Lock Washers: Helical, spring type, ASME B18.21.1.
  - 1. Provide Type 316 stainless steel washers.

#### 2.04 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

#### 2.05 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding to the greatest extent possible, unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
  4. Weld exposed corners and seams continuously, unless otherwise indicated.
  5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

## 2.06 STEEL-FRAMED STAIRS

### A. Stair Framing, General

1. Fabricate stringers of plates or channels, as indicated.
  - a. Provide closures for exposed ends of channel stringers.
2. Construct platforms of stainless steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements indicated.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

### B. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from pressure-locked stainless steel grating with 1-by-3/16-inch bearing bars at 11/16 inch o.c. and crossbars at 4 inches o.c.
2. Surface: Plain
3. Finish: Brushed stainless steel
4. Fabricate stainless steel grating treads stainless steel angle or stainless steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

5. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Bolt grating to platform framing.

## 2.07 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.

## PART 3 EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding/bolting stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units which are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

### 3.02 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set stainless steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.03 ADJUSTING AND CLEANING

- A. Clean field welds, bolted connections, and abraded areas and repair damaged finishes to match adjacent finished stair components; repairs are subject to the acceptance of the Commissioner.

-END OF SECTION-

**Section 05512**  
**INTERIOR METAL STAIRS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
1. Pre-assembled stainless steel stairs with concrete-filled treads.
  2. Industrial-type stainless steel stairs with grating treads.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete for concrete fill for stair treads and platforms
- B. Section 05522 - Interior Pipe and Tube Railings (Stainless Steel), for pipe and tube railings attached to metal stairs and to walls adjacent to metal stairs

**1.03 PERFORMANCE REQUIREMENTS**

- A. Structural Performance of Stairs: Provide stairs complying with NYC Building code requirements and capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft.
  2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  3. Uniform and concentrated loads need not be assumed to act concurrently.
  4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  5. Limit deflection of treads, platforms, and framing members to  $L/240$  or  $1/4$  inch, whichever is less.
- B. Seismic Performance: Provide stairs capable of withstanding the effects of earthquake motions in accordance with NYC Building code requirements.
- C. Calculations: Provide stair design calculations prepared by a NYS Licensed Engineer demonstrating compliance with requirements indicated.

**1.04 SUBMITTALS**

- A. Product Data: For metal stairs and the following:
1. Metal-pan stair treads
  2. Nonslip aggregates and nonslip-aggregate finishes



3. Stainless steel grating treads
  4. Abrasive nosings
  5. Grout
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors and bolts specified for installation under other Sections.
  2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes:
1. Stair treads with nonslip-aggregate surface finish.
- E. Welding certificates.
- F. Qualification Data
1. For NYS Licensed Professional Engineer
  2. Testing Agency
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
1. Test railings according ASTM E894 and ASTM E935
- H. Certified Engineering Calculations.
- 1.05 QUALITY ASSURANCE
- A. Installer Qualifications: Fabricator of products similar to work of this project for a period of not less than three (3) years.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
1. Industrial-Type Stairs: Industrial class

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel"
2. AWS D1.6, "Structural Welding Code--Stainless Steel"

1.06 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Subject to compliance with requirements, products and manufacturers that may be incorporated into the Work include, but are not limited to, products and manufacturers specified.

2.02 METALS

- A. Metal Surfaces, Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.03 STAINLESS STEEL

- A. Tubing: ASTM A554, Grade MT 316L
- B. Pipe: ASTM A312, Grade TP316L
- C. Plate and Sheet: ASTM A666, Type 316L
- D. Gratings: ASTM A666, Type 316L
- E. Expanded Metal: ASTM F1267, Type II (expanded and flattened), Class 3 (corrosion-resistant steel), made from stainless-steel sheet complying with ASTM A666, Type 316
  1. Style Designation: 3/4 number 13

## 2.04 STAIR NOSINGS

- A. Cast-Metal Units: Cast aluminum with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers
    - a. American Safety Tread Co., Inc.
    - b. Balco Inc.
    - c. Barry Pattern & Foundry Co., Inc.
    - d. Granite State Casting Co.
    - e. Safe-T-Metal Co.
    - f. Wooster Products Inc.
    - g. Or approved equal
  - 2. Configuration: Cross-hatched angle-shaped units, same depth as bar-grating treads and 1 to 1-1/2 inches wide.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed bottoms, sides, and edges of extruded units set into concrete.

## 2.05 FASTENERS

- A. Stainless Steel: Type 316 fasteners
- B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
  - 1. Material for Anchors: Alloy Group 2 (A4) stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

## 2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- B. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- C. Concrete Materials and Properties: Comply with requirements in Section 03300 - Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
- D. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
- E. Welded Wire Fabric: ASTM A185, 6 by 6 inches--W1.4 by W1.4, unless otherwise indicated.

## 2.07 FABRICATION

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms to supporting structure.
  - 1. Fabricate treads and platforms of stairs so finished walking surfaces slope to drain.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously, unless otherwise indicated.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to water or other fluids in a manner to exclude fluids. Provide weep holes where fluids may accumulate.

## 2.08 STAINLESS STEEL FRAMED STAIRS

### A. Stainless Steel Stair Framing:

1. Fabricate stringers of tubes, plates, or channels.
  - a. Provide closures for exposed ends of channel stringers.
2. Construct platforms of plate or channel headers and miscellaneous framing members.
3. Weld stringers to headers; weld framing members to stringers and headers. If using bolts to fabricate, join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board or masonry assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

### B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from stainless steel sheet of thickness needed to comply with performance requirements.

1. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
2. Construct subplatforms with smooth soffits.

- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded steel grating with 1-1/4-by-3/16-inch bearing bars at 15/16 inch on center and crossbars at 4 inches on center, NAAMM designation: W-15-4 (1-1/4 x 3/16) STAINLESS STEEL.
  2. Surface: Serrated
  3. Finish: Stainless steel

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete or masonry, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding Requirements
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- G. Place and finish concrete fill for treads and platforms to comply with Section 03300 - Cast-in-Place Concrete.

- 1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

### 3.02 METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.03 STAINLESS STEEL TUBE RAILINGS

- A. Comply with requirements of other Section 05522 – Interior Pipe and Tube Railings (Stainless Steel) for handrails and the following.
- B. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
  - 1. Anchor posts to steel by welding directly to steel supporting members.
  - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- C. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
  - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
  - 2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 3. For hollow masonry anchorage, use toggle bolts.

4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

#### 3.04 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.
- B. Clean metal stairs and railings of dirt, debris, spatters and deleterious materials.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 05521**  
**EXTERIOR PIPE AND TUBE RAILINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes exterior stainless-steel pipe and tube railings, as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-In-Place Concrete
- B. Section 03450 - Plant- Precast Architectural Concrete
- C. Section 05511 - Exterior Metal Stairs

**1.03 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required.
  - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  - 2. Fittings and brackets.
  - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
    - a. Show method of finishing and connecting members at intersections.
- D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Qualification Data: For professional engineer.

**1.04 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6, "Structural Welding Code--Stainless Steel"
- C. Comply with structural performance requirements indicated per New York City Building Code.

#### 1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

#### 1.06 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following manufacturers or approved equal:
  - 1. Exterior Stainless-Steel Pipe and Tube Railings:
    - a. Julius Blum & Co., Inc.
    - b. Stainless Fabricators, Inc.
    - c. Wagner, R & B, Inc.; a division of the Wagner Companies
    - d. Or approved equal

## 2.02 METALS, GENERAL

- A. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
  - 1. Tubing: ASTM A 554, Grade MT 316L
  - 2. Pipe: ASTM A 312, Grade TP 316L
  - 3. Castings: ASTM A 743, Grade CF 8M or CF 3M
  - 4. Plate and Sheet: ASTM A 666, Type 316L
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

## 2.03 FASTENERS

- A. General: Provide the following:
  - 1. Stainless-Steel Railings: Type 316 stainless-steel fasteners
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated. When the size, length, or load carrying capacity of an anchor bolt, concrete anchor, or concrete insert is not shown on the Drawings, provide the size, length, type and capacity required to carry four times (safety factor) the design load.
- C. Fasteners for Interconnecting Railing Components
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

## 2.04 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

- C. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 1. At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.05 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
  - 1. Unless otherwise indicated on the Drawings, fabricate railings from 1-1/2 inch inside diameter stainless steel pipe, type 316 Schedule 40 pipe;.
  - 2. Unless otherwise indicated, stainless steel pipe railing assemblies shall consist of two rails welded to posts spaced not more than 60 inches on center.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
  5. Form changes in directions as indicated on the Drawings.
- I. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
  - J. Close exposed ends of railing members with prefabricated end fittings.
  - K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
  - L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  - M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
  - N. Woven-Wire Mesh Infill Panels: Provide where indicated, and fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
    1. Orient wire mesh with wires horizontal and vertical, unless otherwise indicated on the approved Shop Drawing.
  - O. Safety Chains: Provide where indicated, stainless steel link chain fabricated from 3/8" diameter bar stock. Form links approximately 1-1/2" x 2-1/2" and fully welded ends to form links.
    1. Secure chains to posts with 1/2" diameter stainless steel snap-shackle connected to 2-1/2" diameter x 4" stainless steel "D" rings welded to posts.
- 2.06 FINISHES, GENERAL
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.07 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrate and assemblies to receive railings to verify that surfaces have been prepared to receive railing assemblies.

### 3.02 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.03 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.04 ANCHORING POSTS

- A. Anchor posts to concrete surfaces with rectangular flanges, angle type, or floor type as required by conditions, connected to posts and to concrete supporting members as follows:
  - 1. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.

### 3.05 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
  - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt, unless otherwise indicated.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

### 3.06 ADJUSTING AND CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

### 3.07 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 05522**  
**INTERIOR PIPE AND TUBE RAILINGS (STAINLESS STEEL)**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes interior stainless-steel pipe and tube railings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05512 - Interior Metal Stairs, for steel tube railings associated with metal stairs.

**1.03 PERFORMANCE REQUIREMENTS**

- A. In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

- B. Structural Performance: Provide railings complying with NYC Building Code requirements and capable of withstanding the effects of gravity loads and the following minimum loads and stresses within limits and under conditions indicated:

- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

- E. Engineering Calculations: Provide certified calculations prepared by NYS Licensed Professional Engineer demonstrating compliance with requirements indicated.

**1.04 SUBMITTALS**

- A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.  
2. Grout and anchoring cement.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design including mechanical finishes on stainless steel.
- D. Samples for Verification: For each type of exposed finish required.
  - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  - 2. Fittings and brackets.
  - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
    - a. Show method of connecting members at intersections.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Welding certificates.
- G. Qualification Data: For Professional Engineer and testing agency.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- I. Certified Engineering Calculations.

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
  - 1. Provide products by manufacturers with a minimum of three (3) years experience manufacturing similar products to the work of this section.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6, "Structural Welding Code--Stainless Steel."

## 1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

## 1.07 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Blum, Julius & Co., Inc.
  - 2. Paragon Aquatics; Division of Pentair Pool Products, Inc.
  - 3. Pisor Industries, Inc.
  - 4. Stainless Fabricators, Inc.
  - 5. Sterling Dula Architectural Products, Inc.
  - 6. Tubular Specialties Manufacturing, Inc.
  - 7. Tuttle Aluminum & Bronze
  - 8. Wagner, R & B, Inc.; a division of the Wagner Companies
  - 9. Or approved equal

### 2.02 METALS

- A. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

## 2.03 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 316L
- B. Pipe: ASTM A312, Grade TP316L
- C. Castings: ASTM A743, Grade CF 8M or CF 3M
- D. Plate and Sheet: ASTM A666, Type 316L
- E. Expanded Metal: ASTM F1267, Type II (expanded and flattened), Class 3 (corrosion-resistant steel), made from stainless-steel sheet complying with ASTM A 666, Type 316
  - 1. Style Designation: 3/4 number 13

## 2.04 FASTENERS

- A. Provide Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
  - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide cast-in-place, chemical, or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

## 2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined

by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Material for Anchors: Alloy Group 2 (A4) stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.
- C. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.06 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
  1. As detailed.
  2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- L. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

- R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
  - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- S. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.
  - 1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.0428 inch thick.
  - 2. Orient expanded metal with long dimension of diamonds parallel to top rail.
- T. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

## 2.07 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.08 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Dull Satin Finish: No. 6.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.



## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.02 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Article 2.06 Fabrication whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

### 3.03 ANCHORING POSTS

- A. Secure posts to concrete surfaces with stainless steel expansion anchors through flanges, type as required by conditions.

- B. Secure posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
- C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

#### 3.04 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

#### 3.05 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
  - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  - 2. Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.

#### 3.06 ADJUSTING AND CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

#### 3.07 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

-END OF SECTION-

**Section 05532**  
**STAINLESS STEEL FLOOR GRATINGS AND**  
**CHECKERED PLATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install stainless steel floor gratings and checkered plates and accessories, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. Gratings and checkered plates shall be complete with frames, anchors, fastening devices and miscellaneous appurtenances.
- C. The work includes all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- D. This Section includes, but is not limited to, the following items:
  - 1. Stainless Steel Grating
  - 2. Stainless Steel Checkered Plate
  - 3. Stainless Steel Stair Treads and Landings
  - 4. Fastening Devices

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 05120 - Structural Steel

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Society for Testing and Materials (ASTM)
    - a. ASTM A167, Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
    - b. ASTM A276, Stainless and Heat-Resisting Steel Bars and Shapes
    - c. ASTM A480, General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plates, Sheet and Strips

- d. ASTM A666, Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar
  - e. ASTM A793, Rolled Floor Plate, Stainless Steel
  - f. ASTM F593, Stainless Steel Bolts, Hex Cap Screws and Studs
  - g. ASTM F594, Stainless Steel Nuts
2. National Association of Architectural Metal Manufacturers (NAAMM)
- a. ANSI/NAAMM MBG 531, Metal Bar Grating Manual
  - b. ANSI/NAAMM MBG 532, Heavy Duty Metal Bar Grating Manual
  - c. NAAMM MBG 533, Welding Specifications for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating
3. City of New York
- a. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - b. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto

#### 1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. The design live load for grating or plate covering floor openings shall be that designated for the adjacent floor area but not less than a uniform load of 150 pounds per square foot or a concentrated load of 300 pounds distributed over a 12-inch square area at the center of span, whichever produces the greater stress.
- B. The design live load for grating or checkered plate on platforms shall be as designated on the Contract Drawings but not less than a uniform load of 100 pounds per square foot.
- C. Grating or checkered plate in areas subject to vehicular traffic shall be designed for the maximum weight vehicle that can access the area. The maximum design wheel loads for forklifts or other similar wheeled vehicles shall be as indicated on the structural Contract Drawings or as defined by the approved manufacturer. When design wheel loads are not indicated on the Contract Drawings for a certain area or defined by the manufacturer, the design wheel loads shall be defined as 40 percent of the gross loaded weight of the maximum size vehicle to be accommodated.
- D. The maximum allowable deflection due to dead load plus live load shall not exceed the span divided by 240, but not more than 1/4 inch.

- E. Design gratings and checkered plate in accordance with the design criteria specified herein, and the NAAMM specifications, unless otherwise noted on the Contract Drawings or as required by the New York City Building Code, Local Law 76/2008.
- F. Stainless steel plate thickness shall be 1/4 inch minimum. In the event the 1/4-inch plate does not meet the specified deflection or allowable stress criteria, the plate shall be thickened or stiffened with stainless steel angles or bars welded to the bottom of the plate as needed to meet the criteria. Stiffeners shall extend to within 2 inches of supports as a minimum. The ends of all stiffeners shall be welded to a continuous stiffener extending the length of the plate.

#### 1.05 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  - 1. Shop Drawings and Working Drawings, including shop fabrication drawings, and material specifications of all gratings and checkered plates.
  - 2. Manufacturer's specifications and installation instructions for all proprietary materials and reinforcement accessories.
  - 3. Design Calculations: Provide structural calculations for review and approval to verify that proposed grating and checkered plate meet minimum wheel load design requirements.
  - 4. Description of proposed supports for each type and location of grating and checkered plate.
  - 5. Submit samples of grating, checkered plates and fastening devices for review and approval by the Commissioner.
  - 6. Base Shop Drawings upon field-verified dimensions and elevations of existing or partially constructed structure, where applicable, to allow proper review of drawings.
  - 7. Check Shop Drawings for completeness and accuracy and make necessary corrections prior to submittal for review and approval. Obtain Commissioner's approval prior to fabrication.
  - 8. Do not manufacture or fabricate gratings and checkered plates until the Contractor's Shop Drawings and Working Drawings have been approved by the Commissioner.
  - 9. Qualifications Compliance: Submit references and project information to demonstrate the proposed steel floor grating and checkered plate

manufacturer's specialized experience on similar projects of comparable scope and complexity for a minimum of three years.

#### 1.06 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Qualification of Manufacturer: Steel floor grating and checkered plates and accessories shall be provided where indicated on the Contract Drawings and shall be the products of a reputable manufacturer specialized in such work who is regularly engaged in the manufacture of steel floor grating and checkered plates with a minimum of three years of documented experience.
- C. Testing and Inspection: Material and fabrication procedures are subject to inspection and tests in the mill, shop and field by the Commissioner. Such inspection and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- D. Factory Inspection: Except as specified otherwise in this paragraph, factory tests and inspections of materials for which inspections and tests are specified herein, or in referenced documents, will not be required provided that certified copies of factory test reports, which shall include manufacturer's certificates of compliance with all requirements of these specifications, are submitted to and approved by the Commissioner. When the test reports are on materials previously manufactured, test reports shall be accompanied by notarized statements from the manufacturer certifying that the materials being furnished are identical with previously manufactured materials on which the factory test reports are based.
- E. Shop and Working Drawing Reviews: Obtain such reviews before custom fabrication is started and before delivery of materials to the project site.
- F. Coordination: Coordinate work of this Section with the work of other trades so that construction is not delayed.
- G. Responsibility for Errors: Accept responsibility for errors of detailing and fabrication and for the correct fit of the floor deck units.
- H. Remedial Action: Promptly remove and replace materials, fabrications and workmanship found defective and provide new acceptable work in accordance with contract requirements at no additional expense to the City of New York.

#### 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver products to the site in an undamaged condition and at such intervals as will avoid delay in the work.

- B. Handling: Handle products safely and in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting.

## 1.08 PROJECT CONDITIONS

- A. Check all dimensions in the field after all piping and equipment are set in place and determine the exact dimensions and locations of openings and cut-outs.
- B. Provide templates where required for location and size of openings and cut-outs.
- C. Field verify all pertinent dimensions prior to grating and checkered plate fabrication.

## PART 2 PRODUCTS

### 2.01 TYPES OF GRATINGS AND CHECKERED PLATES

- A. Type of Gratings: Unless otherwise shown or specified, gratings shall be one of the following types and shall be the product of one manufacturer. The type of grating specified herein or in other Sections shall be used exclusively throughout the work.
  - 1. Type "A" - Parallel bearing bars, with cross members at right angles
  - 2. Type "B" - Parallel bearing bars, with diagonal cross members
- B. Types of Checkered Plates: Checkered plates, where indicated on the Contract Drawings, shall be:
  - 1. Type "F" - Fixed Cover
  - 2. Type "H" - Hinged Cover

### 2.02 MATERIALS

- A. Floor gratings, checkered plates and appurtenances shall be fabricated of Type 316L Stainless Steel and shall conform to the requirements specified herein and to the following standards:
  - 1. Gratings: ASTM A167; ASTM A480; ASTM A666
  - 2. Checkered Plate: ASTM A793
  - 3. Frames, Curb Angles, Braces, Skirt Angles, Bolts and Fastening Devices: ASTM A276; ASTM A480; ASTM F593, ASTM F594



## 2.03 GRATING FABRICATION

- A. Type "A" Grating (Pressure Locked or Welded) shall consist of parallel bearing bars spaced not more than 1-3/16 inches on centers joined by cross members spaced not more than 4 inches on center (unless shown otherwise on the Contract Drawings), to form rectangular openings. Approved welded, electric-forged, slotted, friction fitted or interlocking joints shall be used in joining cross members to the bearing bars to give the grating the required strength, rigidity and durability. The distance between the support and the nearest cross bar shall not exceed 2 inches.
- B. Type "B" Grating (Welded or Riveted) shall consist of parallel bearing bars spaced not more than 1-5/16 inches on center, joined by welded or riveted bent diagonal cross bars. Rivets shall be 1/4 inch in diameter and shall be spaced not more than 4 inches on center unless shown otherwise on the Contract Drawings. The distance between the support and the center of the nearest rivet shall not exceed 1 inch.
- C. Provide 1-1/4-inch minimum grating depth with bearing bars not less than 3/16 inches thick.
- D. Welded cross members shall not be less than 3/16 inch in thickness. Mechanically interlocked cross members shall not be less than 1/8 inch in thickness. The depth of cross members shall not be less than one-half the depth of the bearing bars, but such depth need not exceed one inch. Riveted cross members shall be as specified for mechanically interlocked cross members.
- E. Serrated grating shall be provided where shown on the Contract Drawings. Depth of serrated grating shall be not less than 1/4 inch greater than required standard bar grating.
- F. Each section of grating shall be sized to weigh a maximum of 100 pounds unless noted otherwise in the Specifications.

## 2.04 GRATING CUT-OUTS

- A. Provide cut-outs in the grating for the passage of pipe, valve stems, columns and similar work. Where more than two bearing bars are included in the cut-out, banding bars of the same dimensions as the bearing bars shall be provided around the opening and welded or electric-forged to the component parts of the grating.

## 2.05 GRATING STAIR TREADS AND LANDINGS

- A. Grating stair treads shall be one inch wider than tread widths shown on the Contract Drawings and shall be securely fastened to angles or carrier bars which in turn shall be fastened to stringers. The outer edge or nosing of stair treads shall be so constructed as to make it distinctly visible and contrasting with the other part of the tread. Non-slip nosings shall be furnished on all the stair treads and landings.

## 2.06 CHECKERED PLATES

### A. General

1. Provide an approved, raised pattern, non-skid surface for checkered plates. Stiffener angles shall be provided as required to meet the loading and deflection limits specified herein.
  2. Fabricate all checkered plate sections so that no one section will weigh more than 150 pounds. Provide flush type lifting handles for all sections of checkered plates.
- B. Furnish Type "F" Fixed Cover checkered plates complete with frames, anchors, lifting handles and stainless steel flush head screw fastenings.
- C. Furnish Type "H" Hinged Cover checkered plates complete with frames, anchors, lifting handles and heavy duty concealed hinges. Hinges shall be Type 316L stainless steel, with stainless steel pins and fastenings. A minimum of two hinges shall be provided for each checkered plate section.

## 2.07 FABRICATION

- A. Gratings and checkered plates shall be accurately fabricated, free from warps, twists or other defects which affect the appearance and serviceability of the grating and checkered plates.
- B. The tops of the grating bearing bars and cross bars shall be in the same plane.
- C. Gratings and checkered plates shall have a mill finish unless otherwise noted on the Contract Drawings.
- D. All welds shall be ground smooth and conform to the requirements of NAAMM MBG 533.
- E. Openings in and edges of all grating sections shall be banded with bearing bars. Bands shall be welded to all intersecting members.
- F. For watertight and gas-tight checkered plate installations, provide neoprene gasket all around the perimeter and between plate sections as shown on the Contract Drawings.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Gratings and checkered plates shall be installed with each section readily removable and replaceable. Adjacent units shall be neatly fitted together.

- B. The clearance at the ends or between sections of gratings and checkered plates shall be a maximum of 1/4 inch.
- C. Tops of gratings and checkered plates shall be set flush with surrounding construction.
- D. Gratings and checkered plates shall be set with a full and uniform end bearing on the stainless steel frames to preclude rocking movement; wedges or similar shimming devices shall not be used.

3.02 FASTENING DEVICES

- A. Install approved fastening devices to hold the gratings rigidly to the supports with means for easy removal.
- B. Fastening devices shall not protrude above the walking surface of the grating.
- C. Install fasteners in accordance with the manufacturer's recommendations.

-END OF SECTION-

## Section 05561

## MISCELLANEOUS METAL CASTINGS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Miscellaneous metal castings shall include all miscellaneous ferrous and non-ferrous castings to be furnished and installed by the Contractor.
- B. Included in this classification are manhole frames, covers and grades, stop plank grooves, cast iron brackets or other cast iron supports for piping, floor drains, traps, cleanouts, special malleable iron castings and inserts and other special castings of any nature or material, and all necessary bolts, nuts, washers, gaskets and other appurtenances required to join sections of castings.

## 1.02 RELATED SPECIFICATION

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting

## 1.03 REFERENCES

- A. ASTM A27 - Steel Castings, Carbon, for General Application
- B. ASTM A47 - Ferritic Malleable Iron Castings
- C. ASTM A48 - Gray Iron Castings
- D. ASTM A148 - Steel Castings, High Strength for Structural Purposes
- E. ASTM A536 - Ductile Iron Castings
- F. ASTM B26 - Aluminum-Alloy Sand Castings
- G. ASTM B96 - Copper-Silicon Alloy Plate, Sheet, Strip and Rolled Bar for General Purposes and Pressure Vessels
- H. ASTM B98 - Copper-Silicon Alloy Rod, Bar, and Shapes
- I. ASTM B148 - Aluminum-Bronze Sand Castings
- J. ASTM B584 - Copper Alloy Sand Castings for General Applications

K. NY Spec 20-I-1 - Iron Castings, Gray and Malleable

L. American Association of State Highway and Transportation Officials (AASHTO)

#### 1.04 DESIGN REQUIREMENTS

A. Castings exterior to structures shall be designed for an AASHTO H-20 truck loading, unless otherwise noted on the Contract Drawings.

B. Interior castings shall be designed for the loading designated on the Contract Drawings for the adjacent floor area. If no loading is designated, castings shall be designed for a minimum load of 300 pounds per square foot, or as required for their intended use.

#### 1.05 SUBMITTALS

A. The Contractor shall submit working drawings and material specifications for approval in accordance with the requirements of the General Conditions and of Section 01330 – Shop Drawings.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

A. Metal castings shall conform to the requirements specified herein and to the following standards:

- |    |  |   |                               |
|----|--|---|-------------------------------|
| 1. | Gray Iron                              | - | ASTM A48, NY Spec 20-I-1      |
| 2. | Malleable Iron                         | - | ASTM A47                      |
| 3. | Carbon Steel                           | - | ASTM A27                      |
| 4. | Alloy Steel                            | - | ASTM A148                     |
| 5. | Manganese Bronze                       | - | ASTM B584                     |
| 6. | Aluminum Alloy                         | - | ASTM B26                      |
| 7. | Aluminum Bronze                        | - | ASTM B148                     |
| 8. | Copper Silicon Alloys (Silicon Bronze) | - | ASTM B96, ASTM B98, ASTM B584 |

B. Where these metals are designated by class, grade, type, alloy, temper or coating, they shall conform to the requirements of the Specifications or as shown on the Contract Drawings.

C. Gray Iron castings shall conform to the requirements of ASTM A48 and manhole frames and covers shall be Class 25B, 30B or 35B with Class 25B, having a tensile strength of 25 ksi, being the lowest class utilized. Pier cleats, bollards and machinery castings shall be Class 20B or 25B with Class 20B having a tensile strength of 20 ksi, being the lowest class utilized.

- D. High Strength Yellow Brass: Commercial designation for this alloy is leaded manganese bronze and castings shall conform to the requirements of ASTM B584, copper alloy UNS No. C86700 (former designation B32-B).
- E. Silicon Bronze castings shall conform to the requirements of ASTM B584, copper alloy UNS No. C87610 (former designation B198-12A).

## 2.02 FABRICATION

- A. Castings shall be true to pattern in form and dimensions without sharp unfiltered angles or corners, free from pouring faults, sponginess, cracks, blow holes and other defects in positions affecting their strength.
- B. All castings shall be made accurately to the dimensions shown on the Contract Drawings and shall be planed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowance shall be made in patterns so that specified thicknesses will not be reduced.
- C. Manhole covers and floor plates shall conform to the details shown on the Contract Drawings or in their absence to the standards of the Department of Sanitation and shall be true and seat evenly at all points.
- D. Catalog numbers indicated on the Contract Drawings are given to show required types and configurations. All covers shall be cast with raised letters as designated on the Contract Drawings.

## 2.03 IRON CASTINGS

- A. General - Iron Castings shall include, but not be limited to frames, covers, and grates for trench drains, catch basins, and inlets; and stop log grooves.
  - 1. Castings shall be of gray iron of uniform quality, free from defects, smooth and well cleaned by shotblasting.
  - 2. Catalog numbers on the Drawings are provided only to show required types and configuration. All covers shall be cast with raised letters as designated on the Drawings.
  - 3. Castings shall be as manufactured by Dewey Brothers, or Neenah Foundry Company, or approved equal.
- B. Covers and Grates
  - 1. Covers and grates shall be provided with matching frames. Cover shall fit flush with the surrounding finished surface. The cover shall not rock or rattle when loading is applied.

2. Round covers and frames shall have machined bearing surfaces.
3. Design loadings
  - a. Where located within a structure, a minimum design loading of 300 psf shall be used, unless noted otherwise.
  - b. At all locations not within a structure, the design loading shall be a standard AASHTO H-20 truck loading, unless otherwise noted.
4. Watertight gasketing, bolting, locking devices, patterns, lettering, pickholes, vents, or self-sealing features shall be as detailed on the Contract Drawings.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. All castings shall be erected to accurate grades and alignment and when placed in concrete or other surrounding materials, shall be carefully supported to prevent movement during placement of concrete or other materials.

#### 3.02 PAINTING

- A. Where metal castings are required to be painted, such work shall be done in conformity with Section 09911 – Exterior Painting and Section 09912 – Interior Painting.
- B. Non-ferrous castings shall be painted only when so stated in the Specifications.
- C. Outdoor manhole frames and covers are not required to be painted.

-END OF SECTION-

**Section 05660**  
**CARRIAGE RAIL SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install all track work to the limits indicated or as directed by the Commissioner to provide a fully operational carriage track system, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. Work includes but shall not be limited to carriage rails, sole plates, elastomeric pad, fastening system, rubber rail trough filler, grouting and other carriage rail material. Carriage rail shall be installed on structural reinforced concrete as indicated on the Contract Drawings and in accordance with AREMA guidelines.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03200 - Concrete Reinforcement
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 05675 - Crane Rail System

**1.03 REFERENCES**

- A. See Section 05675, Article 1.03.

**1.04 SUBMITTALS**

- A. Conform to Section 05675, Article 1.04.

**1.05 QUALITY ASSURANCE**

- A. Conform to Section 05675, Article 1.05.

**PART 2 PRODUCTS**

**2.01 RAIL**

- A. General
  - 1. All rail shall be new. Used rail will not be accepted.
  - 2. All rail shall be from continuous cast blooms and shall be identified by a designation for heat number, strand number and bloom number.



3. Classifications, markings and brandings shall conform to AREMA specifications.
  4. Ensure that rail is ultrasonically tested over its full length. Test all rails 100% in-line with a fully computerized DAPCO 300 testing unit or approved equal. Testing shall conform to the requirements of Chapter 4, Part 2, Section 8 of the AREMA Manual.
- B. Rail Section shall be 115 RE, as specified in AREMA Manual for Railway Engineering - Volume 1, Chapter 4 (Rail), Part 1 (Design), Figure 1-1 "115RE Rail Section."
- C. Hardness
1. All rail shall be high-strength rail, in accordance with AREMA Manual for Railway Engineering - Volume 1, Chapter 4 (Rail), Part 2, Sections 2.1.4.1 and 2.1.4.2.
  2. High alloy, high strength rail, such as UIC 860/O Grade 1100A, will not be accepted.
- D. Length
1. Rail shall be furnished in lengths of at least 20 feet.

## 2.02 SOLE PLATE

- A. Conform to Section 05675, Article 2.02.

## 2.03 CARRIAGE RAIL CLIPS AND PAD

- A. Conform to Section 05675, Article 2.03, except that clips shall be equal to Part Number WL 24/115P of the Weldlok series and pad shall be equal to Model Number 140RFS, both as manufactured by Gantrex North America, 275 Curry Hollow Road, Pittsburgh, PA 15236, PH: (800) 242-6873, [www.gantrex.com](http://www.gantrex.com).

## 2.04 SOLE PLATE ANCHORAGE

- A. Conform to Section 05675, Article 2.04.

## 2.05 SOLE PLATE GROUT

- A. Conform to Section 05675, Article 2.05.

**2.06 RAIL SPLICES**

- A. Rail splices shall be made with two standard 115 RE rail 36-inch long joint bars in a manner conforming to AREMA standards.

**2.07 RUBBER RAIL TROUGH FILLER**

- A. Conform to Section 05675, Article 2.06.

**2.08 END RETAINING CLIPS FOR RUBBER RAIL TROUGH FILLERS**

- A. Conform to Section 05675, Article 2.07.

**PART 3 EXECUTION****3.01 INSTALLATION OF TRACK ON STRUCTURAL SLAB**

- A. Conform to Section 05675, Article 3.03.

**3.02 INSTALLATION OF JOINT BARS**

- A. Joint bars shall be clean. Rail joints shall be installed so that bars are not cocked between the base and head of the rail. Bars shall be properly seated in the rail and the full number of correct-size bolts, nuts, and spring washers installed. Bolts shall be placed with nuts alternately on inside and outside of rail. A corrosion resistant lubricant shall be applied to the bolt threads prior to application of nuts. Bolts shall be tightened to torque of approximately 350 ft-lbs, beginning at the center of the joint and working both ways to the ends of the joint. After the track has been in service, but before acceptance of the work, all bolts shall be checked and retightened to a torque of approximately 350 ft-lbs. Defective joint bars designated on the contract drawings, discovered by the Contractor during track repair operations, or as identified by the Commissioner shall be replaced with acceptable joint bars.

**3.03 INSTALLATION OF SOLE PLATES**

- A. Conform to Section 05675, Article 3.04.

**3.04 INSTALLATION OF CARRIAGE RAILPAD AND CLIPS**

- A. Conform to Section 05675, Article 3.05.

**3.05 INSTALLED TOLERANCES**

- A. Conform to Section 05675, Article 3.06.

3.06 MANUFACTURER'S REPRESENTATIVE

- A. Conform to Section 05675, Article 3.07.

3.07 RUBBER RAIL TROUGH FILLER INSTALLATION

- A. Conform to Section 05675, Article 3.08.

3.08 FIELD QUALITY CONTROL

- A. Conform to Section 05675, Article 3.09.
- B. Inspect bolted joints for loose bolts.

-END OF SECTION-

**Section 05675**  
**CRANE RAIL SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install all track work to the limits indicated or as directed by the Commissioner to provide a fully operational crane track system, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. Work includes but shall not be limited to crane rails, sole plates, elastomeric pad, fastening system, rubber rail trough filler, grouting and other crane rail material. Crane rail shall be installed on structural reinforced concrete as indicated on the Contract Drawings and in accordance with AREMA guidelines.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03200 - Concrete Reinforcement
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 05660 - Carriage Rail System

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Railway Engineering and Maintenance of Way Association (AREMA): Manual for Railway Engineering
  - 2. American National Standards Institute/American Society for Nondestructive Testing (ANSI/ASNT)
    - a. ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel
  - 3. American Society of Testing Materials (ASTM)
    - a. ASTM A29 Steel Bars, Carbon and Alloy, Hot-Wrought.
    - b. ASTM A36 Carbon Structural Steel.
    - c. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

- d. ASTM A153 Zinc-Coating (Hot-dip) on Iron and Steel Hardware.
- e. ASTM A193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
- f. ASTM A194 Carbon and Alloy Steel Nuts for High Pressure or High Temperature Service, or Both.
- g. ASTM A325 High Strength Bolts for Structural Steel Joints.
- h. ASTM A449 Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
- i. ASTM A572 High Strength Low Alloy Columbium-Vanadium Structural Steel
- j. ASTM A759 Carbon Steel Crane Rails
- k. ASTM D257 D-C Resistance or Conductance of Insulating Materials
- l. ASTM D395 Rubber Property – Compression Set
- m. ASTM D412 Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
- n. ASTM D471 Rubber Property – Effect of Liquids
- o. ASTM D573 Rubber – Deterioration in an Air Oven
- p. ASTM D624 Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- q. ASTM D1171 Rubber Deterioration – Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
- r. ASTM D1894 Static and Kinetic Coefficients of Friction of Plastic Film and Sheet
- s. ASTM D2084 Rubber Property – Vulcanization Using Oscillating Cure Meter
- t. ASTM D2137 Rubbery Property – Brittleness Point of Flexible Polymers and Coated Fabrics
- u. ASTM D2240 Rubber Property – Durometer Hardness

- v. ASTM D3182 Rubber-Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets
  - w. ASTM F1554 Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
4. American Welding Society (AWS)
- a. AWS D1.1 Structural Welding Code
5. SAE International (SAE)
- a. SAE AS 7240 Spring Lock Washers Washers, Spring Lock, Carbon Steel

#### 1.04 SUBMITTALS

A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:

1. Compliance: Submit supplier's certification that the material delivered to the site is in compliance with specified requirements.
  - a. Include all test results and submittals stipulated in the AREMA Manual and the specified ASTM standards, as they apply.
  - b. Include mill certificates for crane and carriage rail and anchor bolts and as required by paragraphs 1.05D and 2.01A.
2. Samples: Submit, as requested by the submittal reviewer, samples and certifications of materials specified under this Section.
3. Qualifications
  - a. Submit qualifications of rail installer including list of similar projects that the Contractor or his/her specialty subcontractor has completed, along with the respective owner's contact persons for those projects demonstrating experience required by Paragraph 1.05A.
  - b. Welder Qualifications: Submit copy of welder qualification certificates for any welders performing welds in the shop or field.
  - c. Testing Technicians and Testing Agency: Submit data on qualifications of Contractor's proposed testing agency and technicians for approval by the Commissioner prior to performing any work. Comply with related requirements in Paragraph 1.05C.

4. Shop Drawings: Submit shop drawing and product data for:
  - a. Crane rail: Document testing in accordance with AREMA standards. Include:
    - (1) Schedule of rail production, inspection, shipment and final delivery.
    - (2) A detailed description of the steel metallurgy.
    - (3) A detailed description of the methods and procedures to be used to remove hydrogen in the steel.
    - (4) A description of the method and verification testing to achieve the required rail hardness.
    - (5) A description of the ultrasonic testing method and equipment.
    - (6) Method of handling, shipping, unloading, and stacking rail.
    - (7) Certified rail test report showing the test results for chemical composition, yield strength, tensile strength, and date(s) of testing for each heat of rail.
    - (8) Macroetch and ultrasonic test records and all other required test records.
    - (9) Report of physical examinations of rails, for conformance to section and straightness tolerances.
    - (10) Mill certificate of inspections in accordance with Paragraph 1.05C and Brinell hardness readings.
    - (11) Laying schedule of rail shipment indicating rail lengths.
  - b. Crane rail bolt, clip, pad and joint details.
  - c. Carriage rail bolt, clip, pad and joint details.
  - d. Rubber rail trough filler for crane and carriage rail track, including gauge and field side pieces. Shop drawings shall include detailed dimensions of the rubber pieces themselves, as well as their installation in the rail pocket with interfacing crane and carriage rail track components supplied by others. Include Quality Control Program and Quality Control Test reports as specified in Paragraphs 1.05G.1 and 1.05G.2.

- e. Clips for fastening together contiguous pieces of rubber rail trough filler, and all other materials required to complete the installation.
  - f. Manufacturer's data for epoxy grout.
5. Submit the following welding procedure and equipment data:
- a. Samples, procedure qualification welds, test reports including requirements of Paragraphs 1.05E and 1.05F, ultrasonic tests, hardness tests, certificates, welder's qualification, welding procedure, rail correction method, rail preparation, welding equipment manufacturer's instructions.
6. Quality Control Program: Within 15 days of notice to proceed for all crane and carriage track components and rubber rail trough filler, the supplier/manufacturer(s) shall submit their Quality Control Program(s) for review and approval.
7. Manufacturer's Installation Manual: The supplier of rubber rail trough fillers shall submit an installation manual to the Commissioner for approval at least 60 days before installation. After approval, the supplier shall supply at least five copies of the manual to both the Commissioner and the installation contractor.
8. Warranty and Maintenance Manual: Submit in accordance with the requirements of Section 01831 – Operation and Maintenance Manuals as per Paragraph 1.05D herein.
9. Manufacturer's Representative: The supplier of the rubber rail trough fillers shall provide a manufacturer's technical representative at the job site, at no additional cost to the City of New York, to meet with the installation contractor before start of installation to ensure proper preparation and equipment for installation. During at least the first day of installation of the rubber rail trough fillers, the technical representative shall visit the job site to assist the Contractor in the proper installation of the materials in accordance with the Manufacturer's Installation Manual. If the installation must be discontinued for any reason during the period that the manufacturer's representative is on the job-site, said representative shall stay and/or return to the job site when the installation is continued.
10. Trough Filler Installation Procedures: The Contractor shall submit for approval proposed procedures for installing the rubber fillers in rail pocket, including any additional methods not included in the Manufacturer's Installation Manual, and/or any proposed differences. Include proposed method for holding the rubber fillers in place tight against the rails before and during placement of concrete around them. Submit these procedures for approval at least 45 days before installation.



## 1.05 QUALITY ASSURANCE

- A. Track shall be installed by a firm having a minimum of three (3) years experience in the installation of similar installations. Track construction shall be performed under the direction of qualified and competent supervisory personnel experienced in crane rail construction and previous satisfactory experience in the installation of similar installations.
- B. Welding shall be performed under the direct supervision of an experienced welding supervisor or foreman.
- C. Testing Agency/Laboratory: Engage the services of an independent testing laboratory approved by the Commissioner to perform testing specified to be performed by the Contractor. Testing shall be performed by an approved accredited laboratory. Include the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds. Inspectors shall meet the requirements specified in Paragraph 3.09A.2.
- D. The crane rail contractor and carriage rail contractor shall provide mill certificates for the rail and anchor bolts. The mill certificates shall indicate the chemical and physical properties including Brinell hardness of the material. The crane rail and carriage rail manufacturer(s) shall submit four (4) copies of the requisite number of operations and warranty and maintenance manuals as specified in Section 01831 – Operations and Maintenance Manuals. The system shall be warranted for a minimum of two years.
- E. Crane rails shall be inspected prior to final acceptance of the work. The testing shall include:
  - 1. Non-destructive (NDT) rail weld test for each field butt weld
  - 2. Random anchor bolt / rail clip bolt torque tests
- F. Testing and inspection shall conform to applicable sections of the AREMA manual and shall be performed by a qualified inspection agency. All testing and retesting shall be performed at no additional cost to the City of New York.
- G. Manufacturing Quality Control for Rubber Rail Trough Filler
  - 1. Quality Control Program: Comply with the submitted and approved Quality Control Program.
  - 2. Conduct quality control tests to ensure quality and uniformity of rubber material, including but not limited to the following:
    - a. Prepare test slabs, strips or blocks in accordance with ASTM D3182. These slabs or blocks shall be prepared from the same production lot of

compound and the same rate of cure as is used on the finished products supplied for this contract.

- b. Test each batch of mixed compound and produce a rheometer curve to indicate proper mix and cure rates, in accordance with ASTM D2084.
- 3. Permanently mold or emboss manufacturer name, part name, part number, and manufacturing lot number on each part.
- H. Defective Materials: Materials that do not conform to the requirements of the specifications or manufacturer's quality control program shall be considered as defective and shall be replaced with acceptable materials at the expense of the supplier.

## PART 2 PRODUCTS

### 2.01 RAIL

- A. Provide new quality, 171CR (171 lb/yd) crane rail conforming to the shape, hardness and chemical properties of ASTM A759 including Supplemental Requirement S2. The rails shall be supplied with blank ends suitable for butt welding. Rails shall be shipped in pre-fabricated lengths of 39 to 78 feet, with pre-welded lengths as required. Mill certificates shall be provided. All rails shall be manufactured from a single rolling.

### 2.02 SOLE PLATE

- A. Sole plate shall be ASTM A36 or ASTM A572, of sizes indicated on the Contract Drawings, provided for placement in segments of lengths indicated. Plate shall be furnished pre-drilled for anchor bolts. Rail clip lower components shall be shop welded to the sole plate in conformance with AWS D1.1. A removable jacking bolt leveling system shall be provided with the sole plates. Sole plate, with lower clip components welded, shall be hot-dip galvanized as a unit in conformance with ASTM A123.

### 2.03 CRANE RAIL CLIPS AND PAD

- A. The crane rail fastening system shall consist of fully forged weldable adjustable clips, Part Number WL 43/171P of the Weldlok series as manufactured by Gantrex North America, 275 Curry Hollow Road, Pittsburgh, PA 15236, PH: (800) 242-6873, [www.gantrex.com](http://www.gantrex.com) or approved equal. The clips shall consist of two wedge-shaped components. The upper component shall be fabricated of ASTM A29 Grade 1045 forged steel with synthetic rubber nose attached by vulcanization process, and shall be furnished with a hot-dip galvanized finish. The lower component shall be fabricated of ASTM A29 Grade 1030 forged steel and shall not be hot-dip galvanized until after attachment to the sole plate. The rail clips shall provide a minimum lateral adjustment of 3/4 inches. Bolts shall be hex cap screws of strength

consistent with ASTM A325. Nuts shall conform to ASTM A563, Grade DH. Washers shall conform to ASTM F436. Bolts, nuts and washers shall be hot-dip galvanized in conformance with ASTM A153.

- B. The steel reinforced rail pad shall be MK 6 as manufactured by Gantrex North America, 275 Curry Hollow Road, Pittsburgh, PA 15236, PH: (800) 242-6873, [www.gantrex.com](http://www.gantrex.com) or approved equal. It shall be made of synthetic rubber manufactured via extrusion process to minimum 60-foot lengths, with continuous curing. It shall have a steel core for a minimum 90% of pad width. The steel core shall be galvanized. The pad shall include edge seals, top and bottom. Pad elastomer shall meet the following requirements:

<u>Physical Properties</u>	<u>Test</u>	<u>Required</u>
1. Tensile Strength, Min.	ASTM D412	1525 psi
2. Elongation after aging, Min.	ASTM D412	200%
3. Hardness, Shore A	ASTM D2240	75 ± 5
4. Tear Resistance Die "C"	ASTM D624	200 lbs./in.
5. Polymer		Nitrile butadiene
6. Coefficient of Friction	ASTM D1894	1.7 Avg.
7. Water Resistance	ASTM D471	

#### 2.04 SOLE PLATE ANCHORAGE

- A. Anchor bolts shall conform to A449, Type 1 or ASTM F1554, Grade 105 with ASTM A563 heavy hex nuts, ASTM A36 or A572 plate washers at bottom, and SAE AS 7240 spring lock washers at sole plate. Carbon steel anchor bolts, nuts and washers shall be hot-dip galvanized in conformance with ASTM A153. Alternatively, bolts shall conform to ASTM A193 Grade B7 (AISI 4140), with nuts conforming to ASTM A194, Grade 7. Anchor bolts and nuts shall be hot-dip galvanized in conformance with ASTM A153.

#### 2.05 SOLE PLATE GROUT

- A. Sole plate grout shall be non-shrink epoxy grout, of flowable consistency at placement, with minimum 28-day compressive strength of 10,000 psi.

#### 2.06 RUBBER RAIL TROUGH FILLER

- A. General Requirements – Rubber Rail Trough Fillers for both Crane Rail Track and Carriage Rail Track
1. Design
    - a. Rubber fillers shall be designed for placement between the rail and the side of the rail trough in the concrete track slab, as indicated. Rubber fillers shall provide damping, protection from thermal expansion and

contraction, and allow simplified construction. The design shall allow for normal rail deflection on the rail support pad and under traffic loading without transferring this force to the surrounding concrete pavement.

- b. The design shall provide a tight fit with the rail to minimize moisture infiltration and facilitate easy installation in both tangent and curved track.
- c. The tread surfaces of both gauge and field side pieces shall have domed ribs or similar shaped grooves to help absorb initial impact energy of vehicular traffic, prohibiting destructive forces from affecting the rail fastening system or adjacent concrete slab and improving skid resistance of pedestrian and vehicular traffic.
- d. The forming of the tread surface shall match the design of the adjacent concrete trough surface and provide a smooth surface for pedestrian and vehicular traffic running across the track.
- e. Cross-sectional dimensions shall match those shown on the Contract Drawings as close as possible. Slight variations in overall width, flangeway dimensions, and shape from that indicated may be permitted with the approval of the Commissioner, as long as the rubber fillers are compatible with, and match the designs and dimensions of the indicated rails, plates, rail pads, clip assemblies.
- f. Minimum length of gauge and field pieces shall be 15 feet.

## 2. Materials and Manufacture

- a. The elastomeric materials shall be manufactured from a single high quality, homogeneous, ultraviolet and ozone-resistant compound that, when properly cured, will comply with the requirements of this specification.
- b. The cured compound shall be effectively resistant to breakdown and oxidation in sunlight, weathering under outdoor installation conditions, and urban air quality typical of the New York metropolitan area, and permanent deformation under load.
- c. The rubber fillers shall be preformed and free of porosity, surface defects and dimensional irregularities that may affect serviceability.
- d. The material compound shall be designed to provide surface wear resistance and surface chemical spillage protection.
- e. The ends of each piece of rubber filler shall be precision cut with square ends. For lengths longer than the minimum manufactured length, the

square ends and forming of holes for end retainer clips shall be precision matched to ensure a tight fit that will minimize fluid infiltration.

- f. All materials shall be new and warranted to be of the quality specified.

3. Physical Properties: Conform to the following requirements:

- a. Hardness: 65 +/- 5 Durometer Shore A, when tested in accordance with ASTM D2240
- b. Tensile at Break: 1450 psi minimum, when tested in accordance with ASTM D412 - Die C
- c. Elongation, Ultimate: 250% minimum, when tested in accordance with ASTM D412 - Die C
- d. Tear Strength: 200 lbs./in. minimum, when tested in accordance with ASTM D624 - Die C
- e. Heat Resistance: Oven aged for 70 hours at 212°F in accordance with ASTM D573
  - (1) Change in Hardness: 10 maximum Shore A points change, when tested in accordance with ASTM D2240.
  - (2) Change in Tensile Strength at Break: 75% minimum retention, when tested in accordance with ASTM D412.
  - (3) Change in Ultimate Elongation: 75% minimum retention, when tested in accordance with ASTM D412.
- f. Compression Set
  - (1) 25% maximum, when tested in accordance with ASTM D395, for 22 hours at 158°F, 0.375 bar.
  - (2) 60% maximum, when tested in accordance with ASTM D395, Method B, for 22 hours at 257°F, 0.375 bar.
- g. Low Temperature Resistance: Pass, when tested in accordance with ASTM D2137, Method A, 9.3.2 Non-brittle after 3 minutes at -40°F.
- h. Water Resistance: 5% maximum volume change, when tested in accordance with ASTM D471, for 70 hours at 212°F.
- i. Ozone Resistance: 100% minimum quality retention rating, when tested in accordance with ASTM D1171.

- j. Electrical Resistivity:  $1.5 \times 10^7$  ohm-cm minimum, when tested in accordance with ASTM D257.

4. Manufacturing Tolerances

- a. Critical Sealing Dimensions:  $\pm 1$  mm
- b. Square End Cuts:  $\pm 0.50$
- c. End Retainer Hole Drilling:  $\pm 1$  mm
- d. Overall Height Dimensions:  $\pm 3$  mm
- e. Overall Width Dimensions:  $\pm 3$  mm
- f. Non-critical Dimensions:  $\pm 4$  mm

B. Rubber Rail Trough Fillers for Crane Rail Track

- 1. Provide both gauge and field side fillers of the same shape, with wheel flangeways on both sides of the rail.
- 2. Rubber fillers shall be designed for placement against new 171CR crane rail with rail pad, and with clearance to clipped rail support plate assembly, as indicated.

C. Rubber Rail Trough Fillers for Carriage Rail Track

- 1. Provide both gauge and field side fillers. Gauge side fillers shall incorporate a wheel flangeway. Field side fillers shall not incorporate a wheel flangeway.
- 2. Rubber fillers shall be designed for placement against new 115RE tee rail with rail pad, and with clearance to clipped rail support plate assembly, as indicated.

2.07 END RETAINING CLIPS FOR RUBBER RAIL TROUGH FILLERS

- A. For track lengths equal to or shorter than the minimum required length of rubber filler, install only one continuous piece on each side of the rails. Splicing together shorter lengths of rubber filler together will not be permitted.
- B. For tracks longer than the minimum required length of rubber filler, provide steel clips for fastening together contiguous pieces of rubber rail trough filler. Clips shall be formed from hot-rolled square bar,  $3/8"$  x  $3/8"$  square, galvanized to ASTM A153, or Commissioner-approved equal.

PART 3 EXECUTION

3.01 CONTINUOUS RAIL WELDING

- A. Both field welding and shop pre-welding of the rail shall be done using the electric flash-butt method. The subcontractor performing electric flash butt welding shall

have automated equipment for producing quality welds and qualified experienced personnel. Acceptable welding equipment is the K 355 G Welderhead by Holland Company, 1000 Holland Drive Crete, IL 60417-2120, Phone: (708) 672-2300 www.hollandco.com, or approved equal. Welding shall be performed before rail is placed on sole plate and in accordance with AREMA specifications. Field welding of the rail shall be performed while the rail is positioned directly above its required position, so horizontal movement would not be required to set the rail on the sole plate. Protect sole plate finish from damage by welding process.

### 3.02 WELDING PROCESS

#### WELDING RANGE

Rail steel	ASTM A759 (171 lbs./yd. crane rail)
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#### PRODUCTION

Welding time proper (171 lbs./yd. crane rail)	3 to 4 minutes
Overall cycle time allowance	5 to 6 minutes

#### TRACK CURVATURE

Allowable Maximum	N/A
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#### FORGING UNIT

Maximum forging force	72 tons
Maximum machine stroke	3-11/32"
Maximum upset stroke	1"
Maximum upset speed	3/4"/sec.

#### CLAMPING UNIT

Maximum clamping force	200 tons
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#### RAIL ALIGNMENT

Horizontal adjustment	Automatic
Vertical adjustment	Automatic

#### GAP CLOSING

Maximum starting gap	9-1/2"
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WELDING TRANSFORMERS

Transformers rating	150 KVA at 50% duty cycle
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ELECTRIC POWER REQUIREMENTS

Welding power and control system 60 Hz/1 Ph	480 VAC
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HYDRAULIC POWER REQUIREMENTS

Maximum operating pressure	2000 PSI
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COOLING WATER REQUIREMENTS

Minimum consumption - internal	8 GPM
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## 3.03 INSTALLING TRACK ON STRUCTURAL SLAB

- A. Spacing of the rail anchorages on slab shall be as shown on the Contract Drawings. Anchor bolts shall be cast in the concrete beams. Templates shall be used for setting anchor inserts and be securely held to the correct line and grade. Use of the sole plates as templates to hang the bolts in position while casting will be permitted. Check templates before, during and after concrete placement. Coordinate with requirements of Section 03200 – Concrete Reinforcement and Section 03300 – Cast-in-Place Concrete.
- B. The exposed threads of the anchor bolt shall be protected from damage or blockage by debris, grout, etc.
- C. The vertical axis of the installed anchor shall be  $90^{\circ} \pm 2^{\circ}$  to the horizontal plane of the installed sole plate.

## 3.04 INSTALLATION OF SOLE PLATES

- A. Plates shall be positioned level, not following the incidental slope of the slab. Plates shall be centered on the rail gage line (centerline of rail). Use removable jacking bolts under the sole plate to provide accurate sole plate setting to a 1/32 inch vertical tolerance.
- B. Anchor bolt nuts shall be installed hand tight prior to sole plate grouting. The sole plates shall be removed and normalized if excessive anchor bolt torque is required to level the sole plates. Tighten the anchor bolts to a torque of 180 to 200 ft-lbs after the grout has attained the specified strength.



### 3.05 INSTALLATION OF CRANE RAILPAD AND CLIPS

- A. Fasteners shall be installed according to manufacturer's specifications. The vertical clamping force of the rail clip shall allow longitudinal thermal movement of the rail.
- B. Follow the manufacturer's recommendations for the installation of the pad and the clip, specifically:
  - 1. Ensure that the pad is centered under the rail with the grooves up, butt joints.
  - 2. The rail clip upper component should be in contact with the toe of rail.
  - 3. Tighten the clip bolts to a torque of 180 to 200 ft-lbs.

### 3.06 INSTALLED TOLERANCES

- A. The rail shall be installed to the following tolerances:
  - 1. Elevation
    - a. Maximum slope  $\pm 1/8"$  in 10 ft.
    - b. Elevation each side  $\pm 1/8"$
    - c. Differential elevation  $\pm 1/8"$
  - 2. Alignment
    - a. Maximum sweep  $\pm 1/4"$  in 10 ft
    - b. Alignment each side  $\pm 1/4"$
    - c. Gauge  $\pm 1/4"$

### 3.07 MANUFACTURER'S REPRESENTATIVE

- A. Provide on-site inspection by welding system supplier's and rail accessory manufacturer's representatives to insure that recommended installation and operating procedures are followed for welding and bolting. Representatives shall issue inspection reports to the Commissioner.

### 3.08 RUBBER RAIL TROUGH FILLER INSTALLATION

- A. General
  - 1. A factory representative from the supplier of the rubber rail trough filler is required to be on the job site before and during the installation to assist the installer in initial preparation and proper installation.
  - 2. Install the rubber rail trough filler in accordance with the approved Manufacturer's Installation Manual and approved supplier shop drawings, and as instructed by the on-site factory representative. Any differences in the

procedure in that manual and the Specifications herein shall be resolved with the Commissioner as early as possible prior to the start of installation.

#### B. Preparation

1. Before installing rubber rail trough filler in either the crane rail track or carriage rail track, complete the installation of the sole plates, rail support pads, rails and rail clip assemblies. Ensure that the sole plate anchorage is complete, the track is at final alignment, gauge and profile, and rail clip assemblies are installed.
2. Clean the rail, plates, clip assemblies and anchor bolt assemblies of any dirt, debris, and grout or concrete laitance, to ensure proper fit tight seal of the rubber filler pieces against the rail. Blow out any standing water or other liquid in the rail trough areas with compressed air until dry.
3. Using templates cut to the same height and width as the rubber fillers, measure the height from the top of the sole plate to top of rail, to ensure that the rubber fillers will properly match the height and fit with the rail installation assemblies. Make any necessary adjustments in rail assemblies, and/or trim the rubber fillers as required, in accordance with the Manufacturer's Installation Manual from the rubber filler supplier, to ensure a proper fit of the rubber fillers before installation and placement of trough filler concrete.

#### C. Installation

1. Position the pieces of rubber rail trough filler loosely in place along the rail to verify placement and required length. Sawcut the rubber filler to required length, square to the sides.
2. Place the gauge and field side pieces in position against the rail, making sure that it is flush against the web of the rail, and positioned properly in relationship to rail, sole plate and rail clips, as shown on the manufacturer's shop drawings.
3. If the track is longer than the supplied length of rubber filler, splice-join contiguous pieces of rubber filler together using the supplied end retaining clips. They are designed for a very tight fit, so it may be easier to drive them on by tapping one leg partly in first, then driving them all the way on, flush with the side of both rubber pieces.
4. Using the procedures in the approved Contractor's Installation Procedures, fasten the rubber fillers securely to the rail for the whole length of the rubber. The proposed fastening method shall secure the rubber filler flush with and against the rail but not damage the rubber fillers.

5. Place removable temporary tape on top of the rubber fillers and rail to protect them from concrete spillage and curing compound during concrete placing/finishing/ curing operations.
6. Place/finish concrete around the rubber fillers as specified in Section 03300 – Cast-in-Place Concrete. Run joint edge tool along top corner of concrete next to the rubber fillers.
7. Remove protective tape from the top of the rail and rubber fillers.
8. Cut the exposed plastic banding off flush with the concrete using a knife, taking care not to nick the rubber fillers or damage the concrete.
9. Do not run rail vehicles or rubber-tired vehicles on or across the track until the concrete has reached sufficient cure.

### 3.09 FIELD QUALITY CONTROL

- A. Quality control inspection and field testing shall be performed by the Contractor in accordance with the following requirements:
  1. Track: Inspection shall be performed to ensure that all the requirements of these specifications are met. Rail, sole plates, rail clips and pads and sole plate anchorage shall be checked to ensure that the rail is properly seated and has full bearing on the sole plate and concrete. Upon completion of construction, measurements of track gage, cross level, and alignment shall be taken and recorded at least once every 25 feet of track centerline length. A copy of these measurements shall be provided to the Commissioner.
  2. Welded Joints - Visual Inspection: Quality control inspection and field testing shall be performed by a technician certified to meet ANSI/ASNT CP-189 level II or III qualifications with a minimum of one year experience in testing rail for defects. Each welded joint shall be inspected by the Contractor in the presence of the Commissioner's Representative on completion of the weld. The Contractor shall pay particular attention to surface cracking, slag inclusion, gas pockets, and lack of fusion. The Contractor shall correct or replace, at no extra cost to the City of New York, any weld found defective. The method of correction shall be as approved by the Commissioner.
  3. Electric Flash-Butt Welding of Rails: Testing shall conform to AREMA Specifications for the Quality Assurance of Electric Flash-Butt Welding of Rails. The testing will determine whether or not each weld meets the quality criteria. Defective welds will be removed and the item re-welded at the Contractor's expense.

-END OF SECTION-

**Section 05820**  
**BRIDGE BEARINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, place and set bridge bearings at the locations indicated on the Contract Drawings, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. The bearing units shall accommodate rotation by the deformation of a confined elastomeric element reinforced with steel plates. Steel reinforced elastomeric bearings shall be fabricated in fixed and expansion versions. The expansion version accommodates movement by means of sliding elements. Expansion versions shall be guided, allowing movement in only one direction.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 05120 - Structural Steel
- C. Section 09911 - Exterior Painting

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. New York State Department of Transportation (NYSDOT)
    - a. Section 565- Bridge Bearings, NYSDOT Standard Specifications
    - b. Section 716-11, Material Specifications for Steel Laminated Elastomeric Bridge Bearings, NYSDOT Standard Specifications
    - c. Section 728-02 and 728-03, Material Specifications for Rubber Impregnated Random Fiber Pad & Plain Rubber Pad, respectively, NYSDOT Standard Specifications
  - 2. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - 3. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto

#### 1.04 SUBMITTALS

- A. Shop drawings are not required for approval by the Commissioner unless a change in the details shown on the Contract Drawings is proposed.
- B. When approved shop drawings are required, they shall be furnished in accordance with the General Conditions, Section 01330 - Shop Drawings and the Steel Construction Manual (SCM), Section 2. The manufacturer shall note the following on all shop drawings:
  - 1. The Contract Number, bridge identification, type, size and quantity of bearing produced.
  - 2. The design load (dead load plus live load) for each type and size of bearing.
  - 3. The effective rubber thickness, typical laminate thickness, compressive data, shear area and shape factor.
  - 4. The Manufacturer's name, the location of the fabrication plant and the name and phone number of the Manufacturer's representative who will coordinate production, inspection, and sampling and testing with the Commissioner.
  - 5. The specification reference and grade of steel used.
- C. Copy of fabrication shop's quality control program.

#### 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Fabricators Quality Control Program: As a minimum, the quality control plan shall address the trace-ability of materials to mill certificates, and the documentation to show that welders and technicians are properly certified to perform the subject work and the inspection, testing and dimensional checks performed during fabrication.
- C. Field welding shall be subject to controlled inspection in accordance with the requirements of the New York City Building Code Local Law 76/2008 and the provisions of the General Conditions. Controlled inspection and testing services required by the New York City Building Code Local Law 76/2008 will be provided by the Commissioner. The Contractor shall cooperate with the Commissioner in the performance of its duties for controlled inspection. Failure of a controlled inspection to detect a defect in materials or workmanship shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Conform to the provisions of Section 05120 - Structural Steel unless otherwise indicated herein.
- B. All materials shall be new with no reclaimed material in the finished bearings.
- C. Steel laminates in steel reinforced elastomeric bearings shall be made from rolled mild steel conforming to ASTM A36, A572 or equivalent and shall have a nominal thickness as shown on the Contract Drawings.
- D. Unless otherwise specified, stainless steel shall conform to ASTM A167 or A240 type 304, and have a minimum thickness as shown on the Contract Drawings. Stainless steel in contact with PTFE sheet shall be polished to a #8 mirror finish.
- E. Bolts shall conform to ASTM A325 (AASHTO M164), ASTM A490 (AASHTO M253), unless otherwise specified.
- F. Requirements for Steel Reinforced Elastomeric Bearings
  - 1. The raw elastomer shall be either virgin neoprene or virgin natural rubber. The elastomer compound shall be classified as being of low temperature grade 0, 2, 3, 4, and 5. The bearings shall be made of elastomer of durometer hardness of 50.
  - 2. The vulcanized bond between elastomer and steel reinforcement shall develop minimum peel strength of 40 pounds per inch. Peel strength tests shall be performed by ASTM D429 Method B.
- G. PTFE resin shall be 100 percent pure new material and shall comply with ASTM D1457. No reclaimed material shall be used. Woven fabric PTFE shall be made from oriented multi-filament PTFE fibers or from a mixture of PTFE fibers made from twisted, slit PTFE tape and other fibers.
- H. Lubricants, if used, shall consist of a combination of solids, which does not react chemically, or electrolytically with the PTFE and its mating surface and shall remain stable in the environmental conditions expected at the site.
- I. The elastomeric compound used in the construction of these bearings shall contain only virgin crystallization resistant polychlorine (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The resulting area shall be free of porous areas, weak sections, bubbles, foreign matter, or other defects affecting serviceability.

## 2.02 FABRICATIONS

- A. Bearings with steel laminates shall be cast as a unit in a mold and shall be bonded and vulcanized under heat and pressure. The mold finish shall conform to standard shop practice. The internal steel laminates shall be sand blasted and cleaned of all surface coatings, rust, mill scale and dirt before bonding and shall be free of sharp edges and burns. External load plates for guided expansion bearings and sole plates for the fixed bearings shall be protected from rusting by the manufacturer, and preferably should be hot bonded to the bearing during vulcanization.
- B. Steel components of bridge bearings shall be fabricated in accordance with the applicable requirements of the NYS Steel Construction Manual (SCM). In addition, component parts of individual bearings shall meet fabrication details as shown on the Contract Drawings.
- C. Each bearing shall be shipped as an assembled unit. Bearings shall be packaged in such a manner to protect all rotating and sliding surfaces from the intrusion of outside material.

## 2.03 PAINTING

- A. Machined finished surfaces in contact, including pins, pinholes, shall receive one coat of automotive grease as soon as machining is complete. None of these surfaces shall be painted.
  - B. Stainless steel and polytetrafluoroethylene surfaces shall not be painted or otherwise coated.
  - C. After fabrication, steel surfaces exposed to the atmosphere, except stainless steel surfaces, shall be shop painted to protect against corrosion.
  - D. The final painting of these surfaces shall be done in the field after completion of all welding.
  - E. Metal to metal surfaces to be field welded shall be given a coat of clear lacquer or other protective coating approved by the Commissioner, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding. Painting, if required, shall be done only after the completion of all welding. Surfaces to be painted shall be primed and painted. Conform to the provisions of Section 05120 - Structural Steel for surface preparation and shop painting unless otherwise indicated herein.
- 1. All metal surfaces shall be cleaned to meet SSPC-SP6, Surface Preparation Specification No. 6 Commercial Blast Cleaning, and painted with three coats of paint. Prime Coat: Immediately after surface preparation, apply shop prime paint as specified in Sections 05120 - Structural Steel and 09911 - Exterior Painting and in accordance with manufacturer's instructions. Use painting

methods that result in full coverage of joints, corners, edges and exposed surfaces.

2. Intermediate Coat: Within four days after manufacturer's recommended cure time for prime coat, apply shop intermediate coat as specified in Sections 05120 – Structural Steel and 09911 – Exterior Painting and in accordance with manufacturer's instructions. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces. Do not exceed specified thickness.
  3. Finish painting of new structural steel will be performed in the field as specified in Section 09911 – Exterior Painting.
- F. Field Painting: Field painting shall not proceed until all erection is complete including field bolting and field welding unless otherwise permitted by the Commissioner.

### PART 3 EXECUTION

#### 3.01 CONSTRUCTION DETAILS

- A. The elevation of the concrete bearing surface may vary from that given on the Contract Drawings depending on the vertical dimension of the actual bearing supplied. The Contractor shall notify the Commissioner of all required elevation changes. Changes to the roadway profile will not be allowed. All elevation adjustments necessary to maintain the profile shall be made to the concrete bearing surfaces. Any adjustments, including changes to the reinforcement, will be made at no additional cost to the City of New York.
- B. Concrete Bearing Surface Preparation. No bearing shall be placed upon a concrete bearing surface, which is deformed, irregular, or poorly finished. The entire bearing surface area shall be floated and troweled.
- C. Setting Anchor Bolts. Anchor bolts shall be set as shown on the Contract Drawings unless changes are permitted by the Commissioner. If anchor bolts are cast in substructure concrete, templates, or other suitable means, shall be used to keep the bolts vertical at the required embedment and in the correct horizontal position during concrete placement.
- D. Bearing Pad Installation. Bearing pads placed between concrete, and/or other masonry, and steel masonry plates shall be located to correct alignment and elevation, and placed at the time of masonry plate installation. Each bearing pad shall be the same size in plan as the masonry plate it supports. Holes to accommodate anchor bolts shall be cleanly and accurately cut prior to bearing pad placement.



### E. Bearing Installation and Alignment

1. General. The centerline of sole plates or other fixed portions of bearing assemblies attached to the structural steel shall not be offset from the centerline of bearing stiffeners or diaphragm connection plates by more than one-half the thickness of the flange at that location, or the thickness of the bearing stiffener or connection plate, whichever is the lesser distance.
2. Fixed. No additional requirements apply.
3. Expansion. These may vary from perfect alignment. Therefore expansion bearings shall be set in accordance with the following:
  - a. The sliding plate shall be centered on the masonry plate under full dead load at an ambient temperature of 68°F.
  - b. The maximum variation from perfect alignment between the centerline of the fixed and movable portions of the bearing device, taking into account the effects of temperature and load at the time of measurement, shall not exceed plus or minus one inch longitudinally unless otherwise indicated on the Contract Drawings. This variation shall be measured as the horizontal distance between the centerline of the sliding plate and the centerline of the masonry plate.
  - c. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted to the Commissioner for approval. All adjustments shall be made at no additional cost to the City of New York.

F. Welding: During field welding operations the temperature of the steel adjacent to the rotational element shall not exceed 194°F. Temperature shall be controlled by welding procedures and monitored using temperature indicating crayons, or other devices. Procedures, crayons, and other devices shall be acceptable to the Commissioner. If the temperature limit is exceeded, notify the Commissioner immediately. The Commissioner will provide the proper repair procedure, which may include complete replacement of the bearing. All repair work shall be done at no additional cost to the City of New York.

G. Grouting Anchor Bolt Holes. All slotted anchor bolt holes in masonry plates shall be filled with concrete grouting material to the top edge of the hole. All excess grout material shall be cleaned from the bearing surfaces in a manner satisfactory to the Commissioner.

- H. Slotted anchor bolt holes in fixed bearings may be filled any time subsequent to stringer placement. Slotted holes in expansion bearings shall be filled only after all necessary bearing adjustments have been made.

### 3.02 FIELD QUALITY CONTROL

- A. Final Verification: Prior to final acceptance of the structure, the Commissioner will verify that all necessary adjustments have been made; that all steel bearings, or sole plates, are permanently welded or attached with cap screws to the superstructure steel as shown on the Contract Drawings; that all slotted holes are completely filled with grout; that all anchor bolts are firmly tightened; and that all other work required to make the bearings fully functional has been completed.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 05830**  
**BRIDGE EXPANSION JOINT ASSEMBLIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work specified in this Section consists of all labor, materials, equipment and services necessary to furnish, fabricate and install an expansion joint system to accommodate movement at interface between ramp structures and building structures, complete in place as shown on the Contract Drawings, as specified herein and as required for a complete installation.
- B. The joints shall be proprietary designs consisting of armored joint segments, angles, anchor studs, threaded studs, bolts, nuts, lock washers, expansion bolt anchors and sealant, all combined as noted on the Contract Drawings so that a fully operational and waterproof system shall seal the joint in which it is installed.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. New York State Department of Transportation (NYSDOT)
    - a. Steel Construction Manual
  - 2. New York City Building Code, Local Law 76/2008, latest edition and amendments or supplements thereto
  - 3. New York City Board of Standards and Appeals (BS&A), latest edition and amendments or supplements thereto

**1.04 SUBMITTALS**

- A. Submit the following in accordance with the General Conditions and Section 01330 - Shop Drawings:
  - 1. Template Drawings - Submit typical expansion joint cross-section(s) indicating pertinent dimensioning, general construction, component connections, and anchorage methods.

2. Submit manufacturer's literature completely describing all materials, standard instructions and any special instructions and/or precautions applicable to this project a minimum of two weeks prior to the supply of these items.
3. Submit references and project information to demonstrate the specialized experience of the proposed manufacturer and applicator in expansion control systems on similar projects of comparable scope and complexity.

#### 1.05 QUALITY ASSURANCE

- A. All work shall comply with the provisions of the New York City Building Code, Local Law 76/2008, and the rules of the Board of Standards and Appeals, latest edition of each and amendments or supplements thereto.
- B. Manufacturer: Shall have a minimum three (3) years of successful experience specializing in the manufacture of heavy duty expansion control systems capable of accommodating vehicular loads and multi-directional movement.
- C. Applicator: The specified expansion control systems shall be installed by the manufacturer's licensed applicator; factory trained and certified in the proper installation of the specified expansion control systems.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original, intact, labeled containers and store under cover in a dry location until installed. Store off the ground, protect from weather and construction activities.

#### 1.07 WARRANTY

- A. The system installer shall furnish a written single source performance warranty that the expansion joint systems will be free of defects related to workmanship or material deficiency for a one (1) year period from the date of substantial completion. The following problems shall be specifically covered under the warranty:
  1. Cohesive and adhesive failure of the expansion joint systems.
  2. Weathering deficiencies resulting in failure of the expansion joint system.
  3. Failure of the expansion joint system resulting from normal traffic use including rubber tipped snowplows without raising plow.
- B. The system installer shall submit a detailed warranty statement for approval consistent with the terms of the specification prior to construction. The approved warranty shall be made part of the contractual agreement and shall represent the sole warranty statement for the project.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. The naming of certain manufacturers in the following provisions is intended to establish a standard of quality and is not intended to limit competition among bidders.
- B. Subject to compliance with all provisions of this section, products of the following manufacturers or equivalent products of alternate manufacturers will be acceptable:

Watson Bowman Acme Corp.  
95 Pine View Drive  
Amherst, NY 14228  
800-253-9226

D.S. Brown Company  
300 East Cheery Street  
North Baltimore, Oh 45872  
419-257-3561

Kinedyne Corporation  
3566 S. Benzing Road  
Buffalo, NY 14127  
888-358-5438

- C. Alternate manufacturers and their products will be considered provided that they meet the design concept and are produced of materials that will satisfy trouble-free operation of the joint system for its intended service life operation and are equal to or superior to those specified in the base product specification.
- D. Proposed alternate systems shall be submitted in accordance with the provisions of Section 01631 – Equivalent Materials and Equipment and receive approval. Manufacturers wishing to submit alternate systems for prior approval shall provide the following:
  - 1. A working 12" sample of the proposed alternate system with a letter describing how the systems are considered equal or superior to the specified systems.
  - 2. A project proposal drawing that illustrates the proposed alternate system installed in the concrete deck and wall panels that are specific to the uses on this project. Typical catalog cut sections will not be considered.
  - 3. Verifiable list of prior installations and contact references showing successful experience with the proposed alternate system.

## 2.02 GENERAL

- A. Provide a heavy-duty floor expansion control system capable of accommodating vehicular loads and multi-directional movements without stress to its components. Throughout normal service, the system shall resist the passage of water through the joint opening, by utilizing the manufacturer's standard preformed seal, which shall be mechanically locked to the members of the assembly.

## 2.03 FLOOR EXPANSION CONTROL SYSTEM PERFORMANCE CRITERIA

- A. Expansion control system assembly shall be capable of accommodating imposed vehicular load of HS-25 Trucks and/or CAT-345B wheel loads as indicated on the Contract Drawings.
- B. Design of expansion control joints at the interface of the access ramp structure and the transfer station building shall allow movement in all directions with maximum allowable movement in:

Longitudinal direction	9 inches
Transverse direction	4 inches and
Vertical direction	2 inches
- C. Joints shall also be capable of allowing thermal movements of the adjacent structures. Functional temperature shall be considered as 120 degrees F. maximum and a minimum of -30 degrees F.
- D. Moisture Barrier: A seal arrangement shall be designed with a configuration allowing maximum movement and flexibility. Side lugs shall mechanically locked into a corresponding metal profile. Material shall be a quality flame-retardant vinyl or approved equal with a minimum material thickness of 0.063 inches. Install profile using Prima Lub or other equivalent adhesive product.
- E. Anchorage: Provide expansion anchorage of sufficient strength to secure base member firmly to concrete slab.
- F. Accessories: Provide necessary sealants and assembly hardware required for complete installation.

## 2.04 FABRICATION

- A. All metal plates and components shall be fabricated in accordance with the requirements of the NYSDOT Steel Construction Manual.
- B. Fire Barriers – Fabricate and ship manufacturer's standard assembly including fire caulks, sealants (if applicable) and hardware for the required hourly rating. Assemblies shall be miter cut in the field as required to accommodate changes in direction.

## PART 3 EXECUTION

### 3.01 INSTALLATION

#### A. Preparatory Work For Expansion Joint System

1. Provide a suitable blackout in the concrete slab to the dimensions indicated on the Contract Drawings and as required and acceptable to the manufacturer for the proper installation of the expansion joint system.
2. Repair all edge raveling at the joint opening or concrete spalls with an approved structural repair compound to provide a solid, square blackout upon which to seat the expansion joint system assembly.
3. Do not install the expansion joint system until the substrate concrete has cured sufficiently in accordance with Section 03300 – Cast-in-Place Concrete. The blackout substrate shall be sandblasted clean of all contaminants and impurities immediately prior to the system installation to assure proper expansion joint system installation.
4. Tape off and protect adjacent deck surfaces to ensure a clean, neat, professional installation.

#### B. Installation

1. Install expansion joint systems in strict accordance with the manufacturer's standard details and written instructions, with technical field support provided by the manufacturer's qualified technical representative. In the event of a conflict, the requirements specified herein shall govern.
2. A technical representative of the manufacturer shall be present at the beginning of the installation. The representative shall be fully knowledgeable and conversant with the correct installation methods in all respects. The representative shall be responsible to advise both the Commissioner and the Contractor that the proper the proper installation method is being followed.

C. Expansion joint systems shall be set to the proper width for the ambient temperature at the time of installation. This information is indicated in the Contract Drawings.

D. Prevent traffic from crossing the expansion joint system until entire assembly is firmly cured and accepted by the Commissioner.

### 3.02 CLEANING AND PROTECTION

A. Protect all expansion joint component parts from damage during installation, placing of concrete and thereafter until completion of construction.



- B. After construction work is complete, clean exposed surfaces with a suitable cleaner that will not harm or damage the elastomeric material.

**-END OF SECTION-**

**Section 06061**  
**UNTREATED TIMBER AND LUMBER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor shall furnish and install all untreated timber and lumber as shown on the Contract Drawings, specified, or required for the Work.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05081 - Galvanizing

**1.03 REFERENCES**

- A. ASTM D245 - Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber
- B. AWP A C20 - Structural Lumber, Fire Retardant Treatment by Pressure Processes
- C. American Wood Preservers Association (AWPA).

**1.04 SUBMITTALS**

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Prior to shipping any materials to the site, the Contractor shall submit to the Commissioner copies of manufacturer's certificates showing compliance with the specified material requirements.
- C. Certification shall be submitted for timber and lumber designated to be fire retardant treated.

**PART 2 PRODUCTS**

**2.01 TIMBER AND LUMBER**

- A. All timber and lumber used for sheeting, shoring, bracing, decking and for other purposes shall be sound and free from any defect that may impair its strength and shall be graded in accordance with ASTM D245. Timber and lumber shall have sufficient strength, be of suitable quality for the purposes intended and be of sizes shown on the Contract Drawings, specified or required for the work.

- B. Timber and lumber for shoring and bracing shall be new, merchantable pine, Douglas fir, or spruce, unless otherwise shown on the Contract Drawings, and shall be squared to the required dimensions throughout its entire length.
- C. Timber and lumber for decking and supports shall be suitable, hard, yellow pine.
- D. No second-hand timber or lumber shall be used where strength and appearance are important considerations and in all cases the Commissioner shall determine if such material is suitable for the proposed use.
- E. Timber and lumber designated on the Contract Drawings or specified shall be pressure impregnated with flame proofing in accordance with AWWA C20.

## 2.02 FASTENERS

- A. Timber and lumber shall be fastened with nails, spikes, bolts, rods, plates, washers and all other hardware shall be of the type, size and spacing to meet the conditions encountered.
- B. Fasteners exposed to the weather shall be hot dip galvanized in accordance with Section 05081 - Galvanizing, unless other materials are indicated on the Contract Drawings.

## PART 3 EXECUTION

### 3.01 STORAGE AND HANDLING

- A. Materials shall be stored on raised platforms, indoors at the site. If outdoor storage has to be incorporated, the material shall be set on raised platforms and covered with suitable weatherproof protective coverings, such as tarpaulins or heavy polyethylene film. Covers shall be battened down to prevent the covers from blowing off.
- B. All timber and lumber shall be carefully handled to avoid splitting or damage to the surface and edges.

### 3.02 WORKMANSHIP

- A. Timber and lumber shall be firmly fastened with approved nails, spikes, bolts, rods, plates and all other hardware of the proper sizes and lengths required to obtain the necessary strength and stability.
- B. All sheeting and bracing shall be installed by skilled mechanics, keyed tight by wedges where necessary and arranged to permit ready withdrawal without endangering the adjacent soil. Sheeting shall not be cracked or split in driving.
- C. Sheeting shall be tongued and grooved where necessary to obtain required results.

- D. The sustaining members in bracing systems shall be designed and constructed to fully support, without undue deflection, all loads imposed.
- E. Wedges, steel plates and other devices approved by the Commissioner shall be used in effecting the necessary reactions. Special care shall be taken to assure the stability of foundations supporting vertical posts.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 06100**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
1. Framing with dimension lumber for staging and temporary construction.
  2. Equipment bases and support curbs.
  3. Wood blocking, cants, and nailers.
  4. Wood grounds.
  5. Plywood backing panels.

**1.02 RELATED SPECIFICATIONS**

- A. Section 06200 - Finish Carpentry  
B. Section 06400 - Architectural Woodwork/Casework, for cabinets and countertops  
C. Division 7 Roofing Sections  
D. Divisions 15 and 16 Mechanical and Electrical Work

**1.03 DEFINITIONS**

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NELMA - Northeastern Lumber Manufacturers Association
  2. NLGA - National Lumber Grades Authority
  3. RIS - Redwood Inspection Service
  4. SPIB - Southern Pine Inspection Bureau
  5. WCLIB - West Coast Lumber Inspection Bureau
  6. WWPA - Western Wood Products Association

**1.04 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
  3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood
  2. Fire-retardant-treated wood
  3. Power-driven fasteners
  4. Powder-actuated fasteners
  5. Expansion anchors
  6. Metal framing anchors

#### 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.
- D. Provide products complying with NYC Building Code requirements.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings. Store products in dry location and cover to prevent from getting wet.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Metal Framing Anchors:

- a. Alpine Engineered Products, Inc.
- b. Cleveland Steel Specialty Co.
- c. Harlen Metal Products, Inc.
- d. KC Metals Products, Inc.
- e. Silver Metal Products, Inc.
- f. Simpson Strong-Tie Company, Inc.
- g. Southeastern Metals Manufacturing Co., Inc.
- h. United Steel Products Company, Inc.
- i. Or approved equal

## 2.02 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

## 2.03 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPAC2 (lumber) , except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
  - a. Chromated copper arsenate (CCA)
  - b. Ammoniacal copper zinc arsenate (ACZA)
  - c. Ammoniacal, or amine, copper quat (ACQ)
  - d. Copper bis (dimethyldithiocarbamate) (CDDC)
  - e. Ammoniacal copper citrate (CC)
  - f. Copper azole, Type A (CBA-A)
  - g. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent



- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- D. Application: Treat all rough carpentry, unless otherwise indicated.

#### 2.04 FIRE-RETARDANT-TREATED MATERIALS

- A. Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPAC20 (lumber). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber.
  - 2. Use treatment that does not promote corrosion of metal fasteners.
  - 3. Use Exterior type for exterior locations and where indicated.
  - 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

#### 2.05 DIMENSION LUMBER

- A. Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

#### 2.06 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
  - 1. Equipment bases and support curbs
  - 2. Blocking
  - 3. Cants
  - 4. Nailers
  - 5. Grounds
- B. For items of dimension lumber size, provide Construction, Stud grade lumber with 19 percent maximum moisture content and any of the following species:
  - 1. Mixed southern pine, No. 1 grade; SPIB

2. Hem-fir or Hem-fir (north), Prime or D Finish grade; NLGA, WCLIB, or WWP
3. Spruce-pine-fir (south) or Spruce-pine-fir, 2 Common grade; NELMA, NLGA, WCLIB, or WWP

## 2.07 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch thick.

## 2.08 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. Provide fasteners of Type 304 or 316 stainless steel, unless otherwise acceptable to the Commissioner.
- B. Nails, Brads, and Staples: ASTM F 1667
- C. Power-Driven Fasteners: CABO NER-272
- D. Wood Screws: ASME B18.6.1
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- G. Bolts: Stainless steel bolts complying with ASTM F 593, Group 1 or 2; with ASTM F 594 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4)

## 2.09 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
  - 1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
  - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
  - 1. Use for interior and exterior locations, unless otherwise acceptable to the Commissioner.

## PART 3 EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. CABO NER-272 for power-driven fasteners
  - 2. Published requirements of metal framing anchor manufacturer
  - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code
  - 4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code

5. Table 2306.1, "Fastening Schedule," in the Standard Building Code
  6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code
- E. Use threaded fasteners, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- 3.02 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION
- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 06200**  
**FINISH CARPENTRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes shelving.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09912 - Interior Painting, for all painting storage areas.

**1.03 DEFINITIONS**

- A. Inspection agencies, and the abbreviations used to reference them, include the following:

1. AWWA – American Wood Preservers Association.

**1.04 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

- B. Samples for Initial Selection: Color charts consisting of actual materials in small sections for each type of material indicated.

- C. Samples for Verification

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.

2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

- D. Research/Evaluation Reports: Showing that fire-retardant-treated wood complies with building code in effect for Project.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer experienced in finish carpentry work similar to the types indicated.
- B. Fire-Test-Response Characteristics: Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Lumber: DOC PS20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
  1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
  2. For exposed lumber, mark grade stamp on end or back of each piece

- B. Medium-Density Fiberboard: ANSI A208.2, Grade MD. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

## 2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA C2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
    - a. Ammoniacal copper quat (ACQ)
    - b. Copper bis (dimethyldithiocarbamate) (CDDC)
    - c. Ammoniacal copper citrate (CC)
    - d. Copper azole, Type A (CBA-A)
    - e. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent
  - 2. Do not use chemical formulations that require incising.
  - 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
  - 4. Kiln-dry material after treatment to levels required for untreated material. Do not use material that is warped or does not comply with requirements for untreated material.
  - 5. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by the American Lumber Standards' Committee Board of Review.

## 2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. Use materials impregnated with fire-retardant chemicals by a pressure process or other means acceptable to authorities having jurisdiction to produce products with the following fire-test-response characteristics:
  - 1. Flame-spread index of not greater than 25 when tested according to ASTM E84 with test continued for a period of 30 minutes with no evidence of significant progressive combustion. Flame front shall not progress more than 10-1/2 feet beyond centerline of burner at any time during test.



- B. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
- C. Interior, Low-Hygroscopic-Type, Fire-Retardant Treatment: Formulation that results in treated material with an apparent moisture content of not more than 28 percent when tested according to ASTM D3201 at 92 percent relative humidity.
- D. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber and plywood from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
- E. Kiln-dry material after treatment to levels required for untreated material. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

#### 2.04 SHELVING

- A. Shelving: 3/4-inch medium-density fiberboard shelving with radiused front.
  - 1. Shelf Cleats: 3/4-by-5-1/2-inch boards with holes to receive clothes rods, of same species and grade indicated above for interior lumber trim for opaque finish. Provide stiffeners as required below shelving.
  - 2. Shelf Brackets: Prime-painted formed steel with provision to support clothes rod where rod is indicated.

#### 2.05 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
  - 1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

#### 2.06 FABRICATION

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.

### 3.03 INSTALLATION

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
  - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
  - 4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

### 3.04 ADJUSTING

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.05 CLEANING

- A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

-END OF SECTION-

**Section 06400**  
**ARCHITECTURAL WOODWORK / CASEWORK**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes the following:
  - 1. Plastic-laminate cabinets
  - 2. Solid-surfacing-material countertops

**1.02 RELATED SPECIFICATIONS**

- A. Section 06100 - Rough Carpentry, for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
- B. Section 07921 - Interior Sealants

**1.03 DEFINITIONS**

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated including cabinet hardware and accessories and finishing materials and processes.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Apply AWI-certified compliance label to first page of Shop Drawings.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
  - 1. Shop-applied opaque finishes
  - 2. Plastic laminates
  - 3. Solid-surfacing materials

D. Samples for Verification: For the following:

1. Lumber and panel products with shop-applied opaque finish, 50 sq. in for lumber and 8 by 10 inches for panels, for each finish system and color, with 1/2 of exposed surface finished.
2. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
3. Solid-surfacing materials, 6 inches square.
4. Corner pieces as follows:
  - a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
  - b. Miter joints for standing trim.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

E. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in Article 1.05, Quality Assurance to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork with sequence-matched wood veneers including wood doors where veneer matching includes door faces.

- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
  - 1. Provide AWI Quality Certification Program certificate indicating that woodwork complies with requirements of grades specified.
- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- F. Mockups: Before fabricating and installing interior architectural woodwork, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Commissioner.
  - 2. Notify Commissioner seven days in advance of dates and times when mockups will be fabricated and installed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Commissioner's approval of mockups before starting interior architectural woodwork fabrication.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in Article 1.07, Project Conditions.

## 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

## 1.08 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
- C. High-Pressure Decorative Laminate: NEMA LD3, grades as indicated, or if not indicated, as required by woodwork quality standard. Subject to compliance with Project requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Formica Corporation
  - 2. International Paper; Decorative Products Div.
  - 3. Laminart
  - 4. Pioneer Plastics Corp.
  - 5. Westinghouse Electric Corp.; Specialty Products Div.
  - 6. Wilsonart International; Div. of Premark International, Inc.
  - 7. Or approved equal
- D. Adhesive for Bonding Plastic Laminate: Contact cement recommended by laminate manufacturer.

- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish. Subject to compliance with Project requirements, provide one of the following:

1. Avonite; Avonite, Inc.
2. Corian; DuPont Polymers
3. Surell; Formica Corporation
4. Fountainhead; International Paper, Decorative Products Div.
5. Swanstone; Swan Corporation (The)
6. Gibraltar; Wilsonart International, Div. of Premark International, Inc.
7. Or approved equal

## 2.02 FIRE-RETARDANT-TREATED MATERIALS

- A. Use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
1. Do not use treated material that does not comply with requirements of referenced woodworking standard or that is warped, discolored, or otherwise defective.
  2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with AWPAC20 (lumber) and AWPAC27 (plywood), for woodwork items indicated as fire-retardant treated. Use the following treatment type:
1. Interior Type A: Low-hygroscopic formulation.
  2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
  3. Kiln-dry material to levels required for untreated material.
  4. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: density, 45-lb/cu. ft; modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 lbf and 225 lbf, respectively.
  5. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: density, 44-lb/cu. ft; modulus of rupture, 1300 psi ; modulus of elasticity, 250,000 psi; linear



expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 lbf and 175 lbf, respectively.

6. Product: Subject to compliance with requirements, provide "Duraflake FR" by Willamette Industries, Inc.

- C. Fasteners: use hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper fasteners with all fire-retardant treated wood products.

## 2.03 CABINET HARDWARE AND ACCESSORIES

- A. Provide cabinet hardware and accessory materials associated with architectural cabinets.

- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

- C. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semi concealed Hinges for Flush Doors: BHMA A156.9, B01361

- D. Back-Mounted Pulls: BHMA A156.9, B02011

- E. Wire Pulls: Back mounted, 5 inches long, 2-1/2 inches deep, and 5/16 inches in diameter.

- F. Catches: Magnetic catches, BHMA A156.9, B03141

- G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

- H. Shelf Rests: BHMA A156.9, B04013

- I. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:

1. Box Drawer Slides: 100 lbf
2. File Drawer Slides: 200 lbf
3. Pencil Drawer Slides: 45 lbf
4. Keyboard Slide: 75 lbf
5. Trash Bin Slides: 200 lbf

- J. Door Locks: BHMA A156.11, E07121

- K. Drawer Locks: BHMA A156.11, E07041

- L. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage. Subject to compliance with requirements, provide "SG series" by Doug Mockett and Co., Inc.

- M. Paper Slots: 17 inches long by 1-3/4 inches wide by 1 inch deep; black, molded-plastic, paper-slot liner with 1/4-inch lip. Subject to compliance with Project requirements, provide Model "CP-1" by Doug Mockett and Co., Inc.
  - N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
    - 1. Satin Stainless Steel: BHM A630
  - O. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.04 FABRICATION
- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.
  - B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
  - C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
  - D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
    - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
  - E. Complete fabrication, including assembly, finishing and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
    - 1. Notify Commissioner seven days in advance of the dates and times woodwork fabrication will be complete.
    - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

- F. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

- 1. Seal edges of openings in countertops with a coat of varnish.

## 2.05 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

- B. Grade: Premium

- C. AWI Type of Cabinet Construction: Flush overlay

- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

- 1. Horizontal Surfaces Other Than Tops: HGS
  - 2. Postformed Surfaces: HGP
  - 3. Vertical Surfaces: HGS
  - 4. Edges: HGS

- E. Materials for Semi exposed Surfaces: Provide surface materials indicated below:

- 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
  - 2. Drawer Sides and Backs: Thermoset decorative overlay
  - 3. Drawer Bottoms: Thermoset decorative overlay

- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

- 1. Provide Commissioner's selections from laminate manufacturer's full range of colors and finishes in the following categories:
    - a. Solid colors with core same color as surface.

- G. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

## 2.06 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for countertops.

- B. Grade: Premium

- C. Solid-Surfacing-Material Thickness: 3/4 inch (19 mm)
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material as selected by Commissioner.
- E. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturers written recommendations for adhesives, sealers, fabrication, and finishing.
- F. Install integral sink bowls in countertops in shop.
- G. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

#### 3.02 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade and type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings

and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with screw bolts through metal backing or metal framing behind wall finish.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches on center and to walls with adhesive.
4. Caulk space between backsplash and wall with sealant specified in Section 07921 - Interior Sealants.

H. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

### 3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

-END OF SECTION-

**Section 07115**  
**BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes cold-applied, cut-back asphalt dampproofing applied to the following surfaces:
  - 1. Exterior face of masonry indicated to receive architectural precast concrete panels.
  - 2. Miscellaneous applications as indicated on the Drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 - Plant - Precast Architectural Concrete
- B. Section 04201 - Unit Masonry
- C. Section 05500 - Metal Fabrications
- D. Section 07210 - Building Insulation
- E. Transformer Building: Within this structure, Consolidated Edison Co. specifications precedence over the contract documents and drawings take

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

**1.04 QUALITY ASSURANCE**

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

**1.05 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing:

- a. Henry Company
- b. Karnak Corporation
- c. Koppers Industries, Inc.
- d. Meadows, W. R., Inc.
- e. Sonneborn, Div. of ChemRex, Inc.
- f. Or approved equal

### 2.02 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing:

1. Brush and Spray Coats: ASTM D 4479, Type I

### 2.03 MISCELLANEOUS MATERIALS

- A. Cut-Back Asphalt Primer: ASTM D 41
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
- B. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
  - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
  - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

3.04 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. On Masonry: Apply primer and one brush or spray coat at not less than 1 gal./100 sq.ft.

3.05 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.
- B. Remove temporary coverings from adjacent surfaces.

-END OF SECTION-



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**Section 07140**  
**FLUID-APPLIED WATERPROOFING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
  - 1. Single-component, non-bituminous, non-asphaltic, modified polyurethane waterproofing for sub-slab applications at Tipping Floor, Loading Floor, Maintenance Equipment Storage Areas , and elsewhere as indicated.
  - 2. Protection course.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 07920 - Exterior Joint Sealants
- C. Section 07921 - Interior Sealants
- D. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over the contract documents.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Provide waterproofing membrane that prevents the passage of water, and is not adversely affected, damaged or degraded by petro-chemicals such as diesel fuel, motor oil, and gasoline.

**1.04 SUBMITTALS**

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, installation instructions and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Samples: For the following products:
  - 1. 12-by-12-inch square of flashing sheet
  - 2. 4-by-4-inch square of protection board
  - 3. 12-by-12-inch square of cured membrane installed on a cement board substrate

- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
- F. Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain waterproofing materials, protection course, and other accessories through one source from a single manufacturer.
- B. Mockups: Apply waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality.
  - 1. If Commissioner determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in "Section 01310 - Project Coordination." Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, protection and repairs.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

## 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
  - 1. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

## 1.08 WARRANTY

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer and Installer agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight within specified warranty period.
  - 1. Warranty Period: Two years after date of Substantial Completion
- B. Warranty shall include all materials and labor required to correct failures, deficiencies and other defects of the entire waterproofing system; and resulting repairs shall be executed to the satisfaction of the Commissioner, and as required to maintain the remaining terms of the "special Manufacturer's Warranty." The City will not incur the costs, fees and other charges related to "warranty" repairs; such costs shall be the responsibility of the Contractor.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide one of the following products:
  - 1. Single-Component, Non-Bituminous, Non-Asphaltic, Modified Polyurethane Waterproofing:
    - a. Anti-Hydro International, Inc.; A-H Seamless Membrane
    - b. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; CCW-525
    - c. Mameco International, Inc.; Vulkem 201
    - d. Pecora; Duramem 500
    - e. Pacific Polymers; Elastodeck B.T.

f. Sherwin Williams; AR 425

g. Or approved equal

## 2.02 WATERPROOFING MATERIALS

A. General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.

1. Produce waterproofing materials suitable for application to vertical, horizontal, and sloped substrates, as applicable.
2. Provide waterproofing materials with not less than 82 percent solids.

B. Cold Fluid-Applied Waterproofing: Comply with ASTM C 836, with manufacturer's written physical requirements, and as follows:

1. Single-component, non-bituminous, non-asphaltic, modified polyurethane waterproofing
2. Tensile Strength: 150 psi (minimum) in accordance with ASTM D412
3. Elongation: 800% in accordance with ASTM D412
4. Hardness: 30-40 shore A in accordance with ASTM D2240
5. Resilience Recovery (Die C): 100% recovery at 100 and 200 percent elongation as per ASTM D 412
6. Adhesion (Peel) Resistance: 8 lbf/in (minimum)

## 2.03 AUXILIARY MATERIALS

- A. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer
- B. Sheet Flashing: 50-mil- minimum, nonstaining uncured sheet neoprene
1. Adhesive: Manufacturer's recommended contact adhesive
- C. Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric

- D. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
  - 1. Backer Rod: Closed-cell polyethylene foam
- E. Protection Course: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows; or as recommended by the waterproofing manufacturer, and as acceptable to the Commissioner.
  - 1. Thickness: 1/4 inch, nominal
  - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
  - 1. Verify that concrete has cured and aged for not less than 28 days or the minimum time period recommended by waterproofing manufacturer, whichever is greater.
  - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 SURFACE PREPARATION

- A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

### 3.03 PREPARATION AT TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.
- B. Prime substrate, unless otherwise instructed by waterproofing manufacturer.
- C. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.
  - 1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

### 3.04 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
  - 1. Comply with ASTM C 1193 for joint-sealant installation.
- B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.
  - 1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

### 3.05 WATERPROOFING APPLICATION

- A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply primer over prepared substrate.
- D. Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
  - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
  - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
  - 3. Verify wet film thickness of waterproofing every 100 sq. ft..

- E. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.

### 3.06 FIELD QUALITY CONTROL

- A. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
  - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
  - 2. Flood each area for 72 hours.
  - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
- B. The City will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

### 3.07 CURING, PROTECTING, AND CLEANING

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
  - 1. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed materials from damage, physical abuse, and other causes. Provide temporary coverings where materials will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

-END OF SECTION-



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**Section 07141**  
**SURFACE APPLIED INTERIOR WATERPROOFING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes interior, surface applied, polyurethane waterproofing system, interstitial floor (Loading Level), roofs of Tipping Level office, electric room, and elsewhere as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 – Cast-in-Place Concrete
- B. Section 03350 – Concrete Finishes
- C. Section 07920 - Exterior Joint Sealants
- D. Section 07921 - Interior Sealants
- E. Section 09010 - Room Finish Schedule

**1.03 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show extent of each surface applied waterproofing system component. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
- C. Samples for Verification: For each type of surface applied waterproofing system required, prepared on rigid backing and of same thickness and material indicated for the Work.
  - 1. Provide stepped samples on backing large enough to illustrate build-up of surface applied waterproofing system; including, but not limited to primers, base coats, flashings, reinforcements, intermediate coats, aggregates, top coats and other system accessories.
- D. Material Certificates: Signed by manufacturer certifying that systems comply with requirements, based on comprehensive testing of current product formulations within the last three years.
  - 1. Include the manufacturer's material certification, which clearly states the materials compliance with VOC limits of authorities having jurisdiction.
- E. Maintenance Data: To include in maintenance manuals specified in Division 1. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

## 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced applicator who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Source Limitations
  - 1. Use primary and secondary materials of a single surface applied waterproofing system manufacturer.
  - 2. Secondary materials shall include, but not be limited to primers, aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended by surface applied interior waterproofing manufacturer.
- C. Fire-Test-Response Characteristics: Provide surface applied interior waterproofing system and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Fire Rating: Class A in accordance with UL 790.
- D. Mockups: Commissioner will select one representative surface for each coating and each substrate to receive surface applied waterproofing coatings/systems. Apply each component of the complete system to at least 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
  - 1. Remove and reapply mockups until they are approved by Commissioner.
  - 2. Keep approved mockups undisturbed during construction as a standard for judging completed traffic coatings. Undamaged mockups may be incorporated into the Work.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.
  - 1. Before installing surface applied interior waterproofing coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, The City of New York, Commissioner, consultants, independent testing agency, and other concerned entities. Review requirements for coating system. Notify participants at least seven days before conference.

### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
  - 1. Manufacturer's brand name
  - 2. Type of material
  - 3. Directions for storage
  - 4. Date of manufacture and shelf life
  - 5. Lot or batch number
  - 6. Mixing and application instructions
  - 7. Color
- B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

### 1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Apply coating systems within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
  - 1. Do not apply coatings when weather conditions do not comply with the waterproofing system manufacturer's requirements; during the application and curing period.

### 1.07 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by surface applied interior waterproofing system manufacturer agreeing to repair or replace coatings that do not comply with requirements or that deteriorate during the specified warranty period.
  - 1. Deterioration of waterproof coatings includes, but is not limited to, the following:
    - a. Adhesive or cohesive failures
    - b. Abrasion or tearing failures

- c. Surface crazing or spalling
- d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

C. Warranty Period: Five years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Physical Requirements: Provide traffic coatings complying with ASTM C 957.
- B. Material Compatibility: Provide primers; base, intermediate, and top coats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

### 2.02 SURFACE APPLIED INTERIOR WATERPROOFING SYSTEM

- A. Available Products: Subject to compliance with requirements, provide a surface applied interior waterproof coating systems as manufactured by Tremco, Incorporated, or approved equal by one of the following:
  - 1. American Colloid Company
  - 2. Watson Bowman Acme Corp.
  - 3. Sonneborn, Div. of ChemRex, Inc.
- B. Selected Products/Systems: Provide the following:
  - 1. Traffic Surfaces/Ramps: Provide interior, traffic bearing, waterproof coating system "Vulkem 350/345/346" as manufactured by Tremco Incorporated.
  - 2. Interior Roof Surfaces, Interstitial Floor Surfaces and Other Locations Indicated:: Provide interior, waterproof coating system "Vulkem 360/351 as manufactured by Tremco Incorporated.
- C. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.
  - 1. Material: Urethane
- D. Base Coats: Manufacturer's standard one-part (single component) liquid polyurethane elastomer.
- E. Intermediate Coat: Manufacturer's standard two-part (multi component) liquid polyurethane elastomer.

- F. Top Coat: Manufacturer's standard single- or multi-component aliphatic liquid polyurethane elastomer.
  - 1. Color: As selected by Commissioner from manufacturer's full range.
- G. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than a total wet film thickness of 50 mils (approximately 44mils dry film thickness) (excluding substrate primer and aggregate).
  - 1. Base Coat: 25-mils wet/ 21-mils dry film thickness; or approximately 60 sq. ft. per gallon
  - 2. Intermediate Coat: 15-mils wet/ 12-mils dry film thickness; or approximately 105 sq. ft. per gallon
  - 3. Top Coat: 9 to 11-mils wet film thickness; or approximately 150 to 175 sq. ft. per gallon
- H. Aggregate: Uniformly graded washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by coating manufacturer.
  - 1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:
    - a. Intermediate Coat: 25 to 50 lb/100 sq. ft.

## 2.03 MISCELLANEOUS MATERIALS

- A. Joint Sealants: Multicomponent urethane sealant recommended in writing by manufacturer for substrate and joint conditions indicated and for compatibility with traffic coatings; complying with ASTM C 920, Type M, Class 25, Grade NS for sloping and vertical applications or Grade P for deck applications, and Use T where subject to traffic or Use NT elsewhere.
- B. Sheet Flashing: 50-mil minimum, nonstaining uncured neoprene sheet material recommended by manufacturer.
- C. Adhesive: Manufacturer's recommended contact adhesive.
- D. Reinforcing Strip: Manufacturer's recommended fiberglass mesh.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements and for other conditions affecting performance of traffic coatings.
  - 1. For the record, prepare written report, endorsed by Applicator, listing conditions detrimental to performance.
  - 2. Verify compatibility with and suitability of substrates.
  - 3. Begin coating application only after minimum concrete curing and drying period recommended by coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
  - 4. Verify that substrates are visibly dry and free of moisture. Test for moisture by method recommended in writing by manufacturer.
  - 5. Application of coating indicates acceptance of surfaces and conditions.

### 3.02 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written recommendations to produce clean, dust-free, dry substrate for coating application.
- B. Mask adjoining surfaces not receiving coatings, drains, and other substrate penetrations to prevent spillage, leaking, and migration of coatings.
- C. Concrete Substrates: Concrete finish type 'D'. See Section 03350 – Concrete Finishes.
  - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
  - 2. Remove concrete fins, ridges, and other projections.
  - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
  - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

### 3.03 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.
- B. Provide sealant cants at penetrations and at reinforced and nonreinforced deck-to-wall butt joints.
- C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

### 3.04 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and coating manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

### 3.05 SURFACE APPLIED INTERIOR WATERPROOFING SYSTEM

- A. Apply coating material according to ASTM C 1127 and manufacturer's written recommendations.
  - 1. Start coating application in presence of manufacturer's technical representative.
  - 2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.
  - 3. Apply coatings to prepared wall terminations and vertical surfaces to height indicated and omit aggregate on vertical surfaces and loading level interstitial floor areas.

### 3.06 FIELD QUALITY CONTROL

- A. Testing: The City will engage a qualified testing agency to perform the following field quality-control testing:
  - 1. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of the Commissioner and Contractor.



2. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures or, if not referenced, using tests cited in manufacturer's product data.
  3. Testing agency shall verify thickness of coatings during coating application.
- B. If test results show coating materials do not comply with requirements, remove noncomplying materials, prepare surfaces, and reapply coatings.
  - C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 CURING AND PROTECTING

- A. Cure coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.
- B. Protect coatings from damage and wear during remainder of construction period.

-END OF SECTION-

**Section 07210**  
**BUILDING INSULATION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Spray-applied thermal insulation
  - 2. Foamed in-place masonry cell thermal insulation
  - 3. Miscellaneous concealed fiberglass insulation

**1.02 RELATED SPECIFICATIONS**

- A. Section 02504 - Sanitary and Storm Sewer Structures, for insulated drainage panels
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 04201 - Unit Masonry, for insulation installed in cavity walls and masonry cells
- D. Section 07211 - Foundation and Underslab Insulation, for insulation installed below slabs
- E. Section 07410 - Metal Wall Panels, for insulation installed as part of the exterior wall system and linear panel system
- F. Section 07610 - Sheet Metal Roofing, for insulation specified as part of roofing construction
- G. Section 07811 - Sprayed Fire-Resistive Materials
- H. Section 07842 - Fire-Resistive Joint Systems
- I. Section 09260 - Gypsum Board Assemblies and Section 09265 - Gypsum Board Shaft Wall Assemblies, for insulation specified as part of drywall construction.
- J. Division 15 Sections for "Piping Insulation" and "Duct Insulation"

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size 12" x 12" units for each type of insulation indicated.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

#### 1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84
  - 2. Fire-Resistance Ratings: ASTM E 119
  - 3. Combustion Characteristics: ASTM E 136

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Glass-Fiber Insulation (Miscellaneous Applications)
    - a. CertainTeed Corporation
    - b. Johns Manville Corporation
    - c. Knauf Fiber Glass
    - d. Owens-Corning
    - e. Or approved equal
  - 2. Spray-Applied Thermal Insulation
    - a. Applegate Insulation, Inc.
    - b. Cafco / Isolotek International, Inc
    - c. Or approved equal

### 3. Foamed In-Place Masonry Cell Insulation

- a. Applegate Insulation, Inc.
- b. Cafco / Isolotek International, Inc.
- c. Or approved equal

## 2.02 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Foil-Faced, Flexible Glass-Fiber Board Insulation: ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
  1. Nominal density of not less than 1.5 lb/cu. ft. (24 kg/cu. m) nor more than 1.7 lb/cu. ft. (26 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
- C. Faced Fiberglass Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, vapor-retarder membrane on one face; consisting of fibers.
- D. Self-Supported, Spray-Applied, Thermal Insulation: ASTM C 1149 for type indicated below, chemically treated for flame-resistance, processing, and handling characteristics.
  1. Type I materials applied with liquid adhesive; suitable for either exposed or enclosed applications.
    - a. Fire Performance Characteristics per ASTM E 84:
      - (1) Flame Spread: 0-5
      - (2) Smoke Developed: 0-10
      - (3) Non-combustible per ASTM E136
    - b. Thermal Insulation Value:  $R = 3.7$  per 1" thickness.
  2. Subject to compliance with requirements provide one of the following:
    - a. "ThermoCon" sprayed thermal insulation by Applegate Insulation

- b. "Heat Shield" sprayed thermal insulation by Cafco / Isolotek International, Inc.
  - c. Or approved equal
- E. Foamed In-Place Masonry Cell Thermal Insulation: ASTM C 1149 for type indicated below, chemically treated for flame-resistance, processing, and handling characteristics.
  - 1. Fire Performance Characteristics per ASTM C 739-97 and C 1149-90:
    - a. Flame Spread: 15
    - b. Smoke Developed: 5
    - c. Non-combustible per ASTM C 739-97 and C 1149-90
  - 2. Thermal Insulation Value:  $R = 3.8$  per 1.3 to 1.6 lb. / cu. ft.

## 2.03 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## 2.04 INSULATION FASTENERS

- A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Adhesively Attached, Spindle-Type Anchors
    - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers
    - b. Eckel Industries of Canada Limited; Stic-Klip Type N Fasteners
    - c. Gemco; Spindle Type
    - d. Or approved equal
  - 2. Insulation-Retaining Washers
    - a. AGM Industries, Inc.; RC150
    - b. AGM Industries, Inc.; SC150
    - c. Gemco; Dome-Cap
    - d. Gemco; R-150
    - e. Gemco; S-150
    - f. Or approved equal

3. Insulation Standoff
  - a. Gemco; Clutch Clip
  - b. Or approved equal
4. Anchor Adhesives
  - a. AGM Industries, Inc.; TACTOO Adhesive
  - b. Eckel Industries of Canada Limited; Stic-Klip Type S Adhesive
  - c. Gemco; Tuff Bond Hanger Adhesive
  - d. Or approved equal
- B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
  1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square
  2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch (2.67 mm) in diameter, length to suit depth of insulation indicated
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
  1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
    - a. Crawlspace
    - b. Ceiling plenums
    - c. Where indicated
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of dimension indicated between face of insulation and substrate to which anchor is attached.
  1. Air Space: 1 inch (25 mm)
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean substrates of substances harmful to insulations, including removing projections capable of puncturing or interfering with insulation attachment.

### 3.03 INSTALLATION, GENERAL

- A. Comply with insulation manufacturers written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

### 3.04 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
  - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

- C. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
  - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
- D. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
  - 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
  - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
  - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- E. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

### 3.05 INSTALLATION OF FOAMED IN-PLACE MASONRY CELL INSULATION

- A. Preparation: Verify that surfaces and conditions are suitable to begin the Work. Masonry ties, and flashings shall be in place prior to proceeding. Report in writing to the Contractor and Commissioner any defects in surfaces or conditions that may adversely affect the performance of the products installed under this Section prior to commencement of the Work. Commencement of the Work shall be deemed as acceptance of surfaces and conditions in the current work area.
  - 1. Clear all cracks, spaces, voids, and openings to be sealed of debris, moisture, ice, and materials prior to the commencement of foaming operations. Clean



substrates of substances harmful to insulations, including moisture, dirt, or unbonded coatings that will effect the insulation or prevent an airtight seal.

2. Cover joints and close off openings to prevent foam leakage. Check to insure that the cavities to be sealed are properly finished, that they are free of debris.
3. Mask areas to be protected from over-spray.
4. Fenestration jambs shall be adequately braced, if necessary, to prevent the expanding foam sealant from bowing or springing the jamb or jamb extension. Foam sealant in these spaces shall be adequate to create a seal, but the spaces do not have to be filled unless required in the Contract Documents (reduces the need for bracing).

#### B. Processing

1. Process a two-component urethane foam system in accordance with the manufacturer's written instructions and recommendations.
2. Monitor and maintain the ratio and mix the components of the urethane chemicals in accordance with the manufacturer's product specifications and processing instructions to achieve the desired density and physical properties. Verify the product component ratio with flow meters and programmable ratio monitoring equipment that can prevent the installation of product that is off-ratio by more than the manufacturer's prescribed limits.
3. Monitor and maintain the component temperatures in accordance with the manufacturer's product specifications and processing instructions to achieve the desired mix, density, and physical properties.
4. Chemical components are to be maintained at a minimum of 60 degrees while stored on site.

#### C. Installation

1. Spray-applied/pumped application of urethane foam insulation shall be performed in accordance with the manufacturer's recommendations. Apply only when surfaces and environmental conditions are within limits prescribed by the manufacturer.
2. Continuity of the spray-applied urethane foam insulation system shall be maintained at all intersections of the building assemblies, across expansion and control joints, and around elements penetrating through the building envelope by sealing with a continuous application of approved sealant.
3. The temperature of the cavities, surfaces, cracks, etc. must be a minimum of 40 degrees during foaming and for a forty-eight (48) hour period after foam

has been placed in the masonry cells. If the ambient temperature is below 40 degrees, the interior temperature must be maintained at 40 degrees for a minimum of eight hours prior to sealing and forty-eight (48) hours after completion. The outside temperature should not be less than 20 degrees unless the outside is protected by temporary or permanent thermal insulation.

4. During foaming operations, the above temperature requirements must be met while providing two (2) air changes per hour for ventilation for installation personnel.
5. Apply the insulation into the masonry cells as recommended by the manufacturer. Minimum foam density shall be 2.0 lb/cu ft; and shall be installed to completely fill the masonry cells, unless otherwise indicated.
6. Trim foam flush with the exposed surfaces. Remove foam from finished surfaces such as window glass, casings, and gypsum board; and other surfaces which will be exposed in the completed construction.

D. Exercise care to avoid damaging insulation during construction.

### 3.06 INSTALLATION OF SPRAYED THERMAL INSULATION

- A. Apply self-supported, spray-applied, thermal insulation according to manufacturer's written instructions. Do not apply insulation until sprayed fireproofing and installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even by using method recommended by insulation manufacturer.

### 3.07 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

### 3.08 CLEANING

- A. Clean off excess sprayed insulation adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of the sprayed insulation.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 07211**  
**FOUNDATION AND UNDERSLAB INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
  - 1. Insulation under slabs-on-grade
  - 2. Insulation between double-slab construction
  - 3. Foundation wall and perimeter wall insulation
  - 4. Vapor retarders, tapes and accessories

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 03200 - Concrete Reinforcement
- D. Section 03300 - Cast-in-Place Concrete
- E. Sections related to Plumbing Work
- F. Sections related to HVAC Work
- G. Sections related to Electrical Work

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- C. Research/Evaluation Reports: For foam-plastic insulation.

**1.04 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84
  - 2. Fire-Resistance Ratings: ASTM E 119
  - 3. Combustion Characteristics: ASTM E 136

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. Extruded-Polystyrene Board Insulation:
    - a. Pactiv Corporation
    - b. Dow Chemical Company
    - c. Owens Corning
    - d. Or approved equal

### 2.02 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:
  - 1. Type VII, 2.20 lb/cu. ft. (60 psi compressive strength), unless otherwise indicated.
  - 2. Type V, 3.00 lb/cu. ft. (100 psi compressive strength), for all horizontal and double slab applications.

### 2.03 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Vapor-Proof Tape: Pressure-sensitive tape of the type, permeance resistance, and other properties recommended by the polystyrene insulation manufacturer for sealing joints, laps and penetrations in, through and about the horizontal/underslab plastic insulation installations.

### 2.04 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
  - 1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch in diameter, length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
  - 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the locations indicated.
  - 2. Air Space: 2 inches, unless otherwise indicated
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

### 2.05 VAPOR RETARDERS

- A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perms.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.03 INSTALLATION, GENERAL

- A. Comply with insulation manufacturers written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated double-slabs or exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

### 3.04 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set units utilizing insulation fasteners or adhesives specifically designed for this application/purpose. Apply fasteners and adhesives according to the manufacturers written instructions. Use only those adhesive recommended by, or acceptable to the insulation manufacturer.
  - 1. If not indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units. Secure perimeter of horizontal insulation areas to prevent insulation movement.

1. Install a continuous, uninterrupted application of the specified vapor-proof, pressure-sensitive tape at all joints, laps, butts, penetrations and terminations of the horizontal/underslab polystyrene insulation. Insulation surfaces requiring such taped joints shall be cleaned and free of materials and conditions which will prevent full adhesion. Install tapes free of wrinkles, twists and similar conditions.
  2. Repair breaks, cracks, tears, punctures and other such conditions in insulations immediately before concealment by other work. Replace insulations that can not be repaired. Cover with vapor-retarder tape or another layer of vapor retarder.
  3. Comply with insulation manufacturers' instructions and written recommendations.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

### 3.05 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders by lapping and sealing. Secure vapor retarders to at top, end, and bottom edges; at perimeter of openings; and at lap joints. Space fasteners 16 inches o.c.
1. Before installing vapor retarder, apply a continuous bead of urethane sealant to surfaces of substrates which define the vapor retarder terminations (including openings). Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over solid substrates.
- C. Firmly attach vapor retarders to solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.



3.06 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

-END OF SECTION-

**Section 07410**  
**METAL WALL PANELS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
1. Factory-formed and field-assembled, exposed-fastener, lap-seam metal wall panel system.
  2. Factory-formed and field-assembled, concealed-fastener, flush interior panel system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 - Plant-Precast Architectural Concrete
- B. Section 05120 - Structural Steel
- C. Section 05400 - Cold Formed Metal Framing
- D. Section 07210 - Building Insulation
- E. Section 07610 - Sheet Metal Roofing
- F. Section 07620 - Sheet Metal Flashing and Trim
- G. Section 07920 - Exterior Joint Sealants
- H. Section 08520 - Aluminum Windows
- I. Section 08630 - Translucent Insulating Panels
- J. Section 10200 - Louvers and Screens
- K. Sections related to Plumbing Work
- L. Sections related to HVAC Work
- M. Sections related to Electrical Work

**1.03 DEFINITIONS**

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight system.
- B. Metal Sheet Thickness: Minimum thickness of base metal without metallic coatings or painted finishes.

**1.04 PERFORMANCE REQUIREMENTS**

- A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.
  - C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 8.0 lbf/sq. ft. and not more than 12 lbf/sq. ft..
  - D. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.
  - E. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
    - 1. Wind Loads: Determine inward and outward loads based on the current New York City Building Code.
    - 2. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/240 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.
      - a. Test Pressures: 150 percent of inward and outward wind-load design pressures
  - F. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" unless otherwise required by applicable code requirements.
  - G. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces
- 1.05 SUBMITTALS
- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.
  - B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment

system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
    - a. Flashing and trim
    - b. Trim
    - c. Panel enclosures
    - d. Outside corner units
  2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed by New York State, responsible for their preparation.
- C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
1. Wall panels and attachments
  2. Girts and other supports, framing and braces
  3. Wall-mounted items including doors, windows, louvers, and lighting fixtures
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories
  2. Trim, Closures and Outside Corner Units: 12 inches long. Include fasteners and other exposed accessories
  3. Accessories: 12-inch- long Samples for each type of accessory
  4. Exposed Gaskets: 12 inches long
  5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of metal wall panels adjacent to joint sealants.
- E. Provide comprehensive engineering analysis signed and sealed by a New York State licensed professional engineer responsible for its preparation. Engineering shall include calculations demonstrating compliance with indicated requirements for panels, anchors and connections.
- F. Qualification Data: Provide qualification data for the Installer, Professional Engineer and the Testing Agency.

1. Include installer's statement of qualifications; a list of completed projects of similar size and scope. Include photographs, address/location information, Owner's/Owner's Representatives names phone numbers for the successfully completed projects.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
  2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
1. Metal Wall Panels: Include reports for air infiltration, water penetration, and structural performance.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Qualified Installer shall have a minimum of three (3) years successful experience in the installation of metal wall panel systems similar in type, size, scope and complexity as those specified herein.
1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of data for metal wall panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Fabricator Qualifications: Certified by wall panel manufacturer to fabricate and install manufacturer's wall panel system.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Section 01631 - Equivalent Materials and Equipment.

1. Do not modify intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If modifications are proposed, submit comprehensive explanatory data to Commissioner for review.
- F. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    - a. Perform tests under environmental conditions replicating those that will exist during installation.
  2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
- G. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of typical corner wall panel, including soffits, trims, liner panels, closures and other trims, as shown on Drawings; approximately 48 inches square by full thickness, including supports, attachments, and accessories.
  2. Approval of mockups is for other material and construction qualities specifically approved by Commissioner in writing.
  3. Approval of mockups does not constitute approval of deviations contained in mock-ups from the Contract Documents, unless such deviations are specifically approved by Commissioner in writing.
  4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

1. Meet with The City of New York, Commissioner, City's insurer (if applicable), testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

**1.08 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

**1.09 COORDINATION**

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, braces and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

**1.10 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.



- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Weathertight Warranty Period: 10 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

1. CENTRIA Architectural Systems
2. Custom Panel Industries, LLC
3. Fabral, Inc.
4. Morin Corporation; a Metecno Group Company

### 2.02 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alclad alloy 3003, 3004, or 3105 for painted finishes, with temper as required to suit forming operations and structural performance required.

1. Alternative alloys include the following:

- a. Alclad Alloy 3003: H14, H16, H24, or H26 temper
- b. Alclad Alloy 3004: H22, H24, H32, or H34 temper
- c. Alloy 3105: H14 or H16 temper
- d. Alloy 5005: H14, H16, H24, H26, H34, or H36 temper

2. Finishes: Apply the following coating to the interior and exterior surfaces of the metal panel system (including accessories), as specified or indicated on Drawings.

- a. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- (1) Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer (0.8 mil), fluoropolymer color coat (0.8 mil), and clear fluoropolymer topcoat (0.8 mil), with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 2.4 mil; and complying with AAMA 2605.

- (2) Color: Match Commissioner's sample; Panetone "Cool Gray No. 2U."

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.

C. Panel Sealants

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer; refer to Section 07920 - Exterior Joint Sealants for additional requirements.

2.03 MISCELLANEOUS METAL FRAMING AND SUPPORTS

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653, G90, hot-dip galvanized zinc coating.
- B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch bare steel thickness, cold-formed, with a G90 hot-dip galvanized zinc-coating complying with ASTM A 653. Provide where girts are not provided under Section 05120 - Structural Steel.
- C. Zee Clips: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.
- D. Base or Sill Angles/Channels: 0.079-inch bare steel thickness, cold-formed, stainless steel.
- E. Fasteners for Metal Framing: Provide non-corrosive stainless steel fastener of the alloy, type, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; and as acceptable to the Commissioner.

2.04 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping stainless steel screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.
1. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head
  3. Blind Fasteners: High-strength aluminum or stainless-steel rivets
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Provide fiberglass batt insulation for installation within metal wall panel system where indicated. Comply with requirements of Section 07210 – Building Insulation.

#### 2.05 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Deep-Box-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, box-shaped ribs that are wider than recesses, evenly spaced across panel width, and with rib/recess sides angled more than 60 degrees.
1. Material: Aluminum sheet, 0.040 inch thick (minimum); but not less than that required to meet the performance criteria specified.
    - a. Exterior Finish: 3-coat fluoropolymer
    - b. Color: Match Commissioner's samples
  2. Rib Spacing: 12 inches o.c., unless otherwise indicated
  3. Panel Coverage: 24 inches, unless otherwise indicated
  4. Panel Height: 4.0 inches, unless otherwise indicated

#### 2.06 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, liner panels, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
1. Closures: Provide formed closures at eaves and rakes, fabricated of same metal as metal wall panels.
  2. Panel End Closures: Provide the manufacturer's custom panel end closure assemblies matching the material, profile and finish of the field panels; assemblies shall be of fully welded/seamless construction.

3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  4. Panel End Closure Strips: Neoprene; closed-cell expanded cellular rubber; crosslinked, polyolefin-foam or closed-cell laminated polyethylene; flexible closure strips; extruded, cut or premolded to match metal wall panel profile. Provide closure strips as secondary seal to close exposed panel end caps, or where indicated or necessary to ensure weathertight construction.
  5. Interior (Liner) Panels: Provide 1-1/2 inch deep by 12 inches wide interlocking (concealed fastener type) panel assemblies formed from 0.032 inch aluminum, to conceal and protect insulation where inner panels are indicated. Provide filler panels and top and bottom trim to provide for continuous finished surface at installed locations.
  6. Corner Units: Provide the manufacturer's standard fully welded corner units/assemblies at all outside corners, unless otherwise indicated. Corner units shall match the field panels in material, profile and finish.
- B. Flashing and Trim: Formed from the same coil coated material as the wall panels. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

## 2.07 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
1. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.08 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
  - 1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  - 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean substrates of substances harmful to insulation, and metal panels including removing projections capable of interfering with attachment.
- B. Install flashings and other sheet metal to comply with requirements specified in Section 07620 - Sheet Metal Flashing and Trim.
- C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.
  - 1. Soffit Framing: Mechanically fasten or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

### 3.03 METAL WALL PANEL INSTALLATION, GENERAL

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Field cutting of metal wall panels by torch is not permitted.
  - 2. Shim or otherwise plumb substrates receiving metal wall panels.

3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
  4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
  5. Install screw fasteners in predrilled holes.
  6. Locate and space fastenings in uniform vertical and horizontal alignment.
  7. Install flashing and trim as metal wall panel work proceeds.
  8. Locate panel splices over structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
  10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
  12. Fasteners: Use gasketed stainless-steel fasteners for surfaces exposed to the interior and exterior.
  13. Provide prefabricated, mitered, and fully welded units at all outside corners. Provide corner cap covers at outside corners of canted wall panels.
  14. Provide Prefabricated panel end panel caps at exposed panel ends.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.
1. Coat back side of aluminum wall panels with bituminous coating where wall panels will contact ferrous metal or cementitious construction.
- C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07920 - Exterior Joint Sealants.

### 3.04 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

#### A. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide gaskets under washer heads of exposed fasteners bearing on weather side of metal wall panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
7. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
8. Provide concealed vent openings at top and bottom of insulated metal cavity wall sections. Comply with panel manufacturer's written recommendations to inhibit condensation, permit drainage and prevent water penetration.

#### B. Interior Panels: Install horizontal sub-girts as indicated. Install batt insulation with vapor barrier between sub-girts. Install interior panels in vertical orientation, secured to sub-girts with concealed fasteners.



- C. Soffit and Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.05 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

### 3.06 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.07 FIELD QUALITY CONTROL

- A. Testing Agency: City will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft.
- C. Water-Spray Test: After completing the installation of 75-foot- by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Commissioner.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.
- E. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.08 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels (wall, liner soffit and accessory) that have been damaged or have deteriorated. Repair by finish touchup or similar minor repair procedures where minor damage has occurred.

-END OF SECTION-

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**Section 07610**  
**SHEET METAL ROOFING**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes, but is not limited to the following:
1. On-site, roll formed standing-seam metal roofing
  2. On-site, roll formed standing seam metal siding
  3. Snow- and ice-guard assemblies
  4. Coordination of the pre-engineered fall restraint system specified in Section 11010
  5. Roof insulation, secondary membrane/vapor barrier, ventilation mats, flashings, concealed gutter, closures, trims, sheet metal ground strips, fasteners, retainers, protective coatings, separators, plastic shield tubes for insulation shield tubes and other accessories

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 - Structural Steel
- B. Section 05312 - Steel Roof Deck
- C. Section 05400 - Cold Formed Metal Framing
- D. Section 06100 - Rough Carpentry
- E. Section 07210 - Building Insulation
- F. Section 07620 - Sheet Metal Flashing and Trim
- G. Section 07721 - Roof Hatches
- H. Section 07920 - Exterior Joint Sealants
- I. Section 10200 - Louvers and Screens
- J. Section 11010 - Fall Restraint System
- K. Sections related to Plumbing Work
- L. Sections related to HVAC Work
- M. Sections related to Electrical Work

**1.03 PERFORMANCE REQUIREMENTS**

- A. General: Provide complete sheet metal roofing system, including, but not limited to, on-site roll-formed metal roof and siding panels, cleats, clips, anchors and fasteners, sheet metal flashing and drainage components related to sheet metal roofing and siding, fascia panels, trim, underlayment, insulation and accessories as indicated and as required for a weathertight installation.
- B. Wind-Uplift Resistance: Provide custom-fabricated sheet metal assemblies capable of resisting negative uplift pressure as required by the current New York City

Building Code. Provide clips, ground strips, fasteners and clip spacings of type indicated and with capability to sustain, without failure, a load equal to 3 times the design negative uplift pressure.

- C. Wind-Uplift Resistance: Provide portable roll-forming equipment capable of producing sheet metal roofing and siding assemblies that comply with UL 580 for Class 90 wind-uplift resistance.

1. Maintain UL certification of portable roll-forming equipment for duration of sheet metal roofing and siding work.

- D. Thermal Movements: Provide sheet metal assemblies that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal roofing thermal movements. Base engineering calculations on surface temperature of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg. F, ambient; 180 deg. F, material surfaces

- E. Water Infiltration: Provide sheet metal roofing and siding that does not allow water infiltration to building interior, with metal flashing and connections of sheet metal roofing lapped to allow moisture to run over and off the material.

#### 1.04 SUBMITTALS

- A. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation layouts of sheet metal roofing and siding, including plans, elevations, and keyed references to termination points. Distinguish between both shop-and field-assembled work, and back coated and non-back-coated sheet metal work. Include the following:

1. Details for forming sheet metal roofing/siding, including seams and dimensions.
2. Details for joining and securing sheet metal assemblies, including layout of fasteners, sheet metal ground strips, clips, and other attachments. Include locations and profiles of seams and expansion joints.
3. Details of termination points and assemblies, including fixed points.
4. Details of expansion joints, including showing direction of expansion and contraction.

5. Details of roof penetrations.
  6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, concealed gutters and counter flashings.
  7. Details of special conditions.
  8. Details of connections to adjoining work.
  9. Details of the following accessory item, at a scale or not less than 1-1/2 inches per 12 inches:
    - a. Typical and atypical flashings and trims; each different type
    - b. Snow guards; include large-scale details of structural connections/attachments
    - c. Fall restraint assemblies; include large-scale details of structural connections/attachments for coordination of system installations; refer to Section 11010 – Fall Restraint Systems for additional requirements
    - d. Concealed gutter assemblies
    - e. Roof hatches
  10. Where assemblies are indicated to comply with structural and other performance criteria specified herein, provide comprehensive engineering analysis signed and sealed by a New York State licensed professional engineer responsible for its preparation. Engineering shall include calculations demonstrating compliance with indicated requirements for systems, anchors and connections.
- C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
1. Sheet metal roofing, sheet metal ground strips and attachments
  2. Purlins and rafters
  3. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, lightning protection devices, fall arrest system supports, snow and ice guards, and other items mounted on roof curbs
- D. Samples for Verification: For each type of exposed finish required, prepared on samples of size indicated below:
1. Sheet Metal Roofing/Siding: 12 inches long by actual pan width, including finished seam. Include fasteners, clips, closures, membranes, and other

attachments. Provide not less than two samples of each different type sheet metal required (back coated and non-coated).

2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
  3. Accessories: 12-inch-long Samples for each type of accessory
  4. Snow Guard System: Full-size Sample
- E. Roll-Forming Equipment Certificate: Issued by UL for manufacturer's portable roll-forming equipment designed for producing sheet metal roofing. Show expiration date no earlier than two months after scheduled end of sheet metal roofing.
- F. Qualification Data: For Installer and fabricator.
1. Include statements of qualification from both the fabricator and the installer; include a list of completed projects of similar size and scope. Include photographs, address/location information, Owner's/Owner's Representatives names phone numbers for the successfully completed projects.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sheet metal roofing and portable roll-forming equipment. Include reports for structural performance.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 5 years successful experience installing sheet metal roofing/siding systems similar in type, size, scope and complexity as those specified for Project and acceptable to the fabricator of sheet metal roofing.
- B. Roll-Formed Sheet Metal Fabricator Qualifications: An authorized representative of roll-formed sheet metal roofing/siding manufacturer for fabrication and installation of units required for the Project with a minimum of 5 years experience fabricating sheet metal roofing similar to this Project.
- C. Professional Engineer Qualifications: A professional Engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for the design, fabrication and installation of the snow and ice guard systems similar to those indicated for this Project; in material, design, and extent.
- D. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual". Conform to dimensions and profiles shown unless more stringent requirements are indicated.

- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of typical roof eave/gutter assembly, including standing seam roofing, gutter, fascia, soffit and snow and ice guard assemblies as shown on Drawings; approximately 24 inches by 48 inches by full thickness, including attachments, underlayment, and accessories.
  2. Build mockup of typical standing seam wall siding assembly, including standing seam siding, closures, fascia, and fillers as shown on Drawings; approximately 24 inches by 48 inches by full thickness, including attachments, underlayment, membranes, and accessories.
  3. Approval of mockups is for material and construction compliance with the contract documents as specifically approved by Commissioner in writing.
  4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal coils or sheet metal roofing pans, components, and other sheet metal roofing and siding materials so as not to be damaged or deformed. Package sheet metal roofing materials for protection during transportation and handling.
- B. Unload, store, and erect sheet metal roofing materials in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on pallets, covered with waterproof covering with ventilation provided from underneath pallets. Store metal coils and sheet metal roofing materials to ensure dryness. Do not store metal coils or sheet metal roofing materials in contact with other materials that might cause staining, denting, or other surface damage.
  1. Store materials away from uncured concrete and masonry.
- D. Protect strippable protective covering on sheet metal roofing and siding from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal roofing installation.

#### 1.07 COORDINATION

- A. Coordinate installation of roof curbs, snow guards, fall restraint systems, equipment supports, and roof penetrations, which are specified in this Section and in other sections.
- B. Coordinate sheet metal roofing and siding with rain drainage work, flashing, trim, and construction of metal decks, wall sheathing, purlins and rafters, bulkhead and



parapet, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.08 WARRANTY

- A. General: Provide special warranties from both the Panel Material Manufacturer and the Panel Fabricator. Both special warranties shall state that the Panel Material Manufacturer/Panel Fabricator agree to replace sheet metal roofing/siding which show evidence of deterioration, or are otherwise defective in manufacture/fabrication within the specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion

- B. Special Installer's Warranty: Sheet metal roofing/siding Installer's warranty, signed by Installer, in which Installer agrees to repair or replace components of custom-fabricated sheet metal roofing/siding that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures
- b. Loose parts
- c. Wrinkling or buckling in excess of oil canning or pillowing within limits generally accepted within the zinc roofing industry.
- d. Failure to remain weathertight, including uncontrolled water leakage
- e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish
- f. Galvanic action between sheet metal roofing and dissimilar materials

2. Warranty Period: Two (2) years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Rheinzink America, Inc.
  2. VM ZINC North America - Sogem USA
  3. Approved equal

**2.02 ROOFING SHEET METALS**

- A. Zinc Sheet: Electrolytic, 99 percent pure zinc alloyed with 1 percent titanium and 1 percent copper, Special High Grade Zinc meeting ASTM B69-11.
  - 1. Thickness: 22 gage (minimum)
  - 2. Finish: Bright rolled
  - 3. Exposed Finish/Appearance: Matching the Commissioner's sample

**2.03 SUBSTRATE MATERIALS**

- A. General: The following materials are listed in order of installation over the properly prepared steel roof deck.
- B. Rigid Roofing Insulation: Provide perlite board type insulation complying with ASTM C 728; composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with a top surface seal coated. Perlite insulation shall be not less than 1-1/2" inches thick and possess a minimum compressive strength of 25lbs/sqft. Provide one of the following:
  - 1. Energy Guard Perlite by GAF Materials Corporation
  - 2. Perlite Roof Insulation by Koppers Industries.
  - 3. Fesco Board by Johns Manville International, Inc.
- C. Insulation Cover Board: Provide 1/2" Fiberglass-Mat Faced Gypsum Roof Board. Provide DensDeck Prime by Georgia Pacific or equal.
- D. Secondary Membrane/Vapor Barrier Underlayment: Self-adhering, 30-40 mils thick, butyl rubber smooth (polyethylene film) faced membrane capable of performing at high temperature up to 240 deg. F as per ASTM D 1970 without degradation or failure. Provide primer when recommended by the membrane manufacturer.
  - 1. Ultra by W.R. Grace, Inc.
  - 2. WIP 300HT by Carlisle Coatings and Waterproofing
  - 3. Perma-Seal PE by Henry Company
  - 4. Or approved equal.
- E. Ventilation Mat/Drainage Conduit: Provide metal roof manufacturer's approved prefabricated geocomposite with plastic (nylon) filament ventilation mat/drainage conduit. Ventilation mat shall be 0.30 inches thick and weigh 8.0 oz/yd<sup>2</sup>.
  - 1. Enkamat 7010 by Colbond Geosynthetics
  - 2. Approved equal

## 2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.
- B. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.
- C. Fasteners: Self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. Fasteners shall be stainless steel.
  - 2. Exposed Fasteners: Minimize use of exposed fasteners limited to application where concealed fastener are not possible. Heads matching color of sheet metal roofing by means of plastic caps or factory-applied coating.
  - 3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling stainless steel screws with hex washer head
  - 4. Blind Fasteners: High-strength stainless-steel rivets
- D. Sealing Type: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to produce joints in sheet metal roofing that will remain weathertight an as recommended by sheet metal roofing manufacturer for installation indicated.
- F. Expansion-Joint Sealant: For hooked-type expansion joints, which must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene sealant.

## 2.05 ACCESSORIES

- A. Sheet Metal Roofing Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, ridge, closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of sheet metal roofing, unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as sheet metal roofing.
  - 2. Clips: Minimum 0.0625-inch-thick, stainless steel panel clips designed to withstand positive and negative-load requirements and to accommodate

- thermal movement without damage or failure. Provide fixed, sliding and "Z" clips as required.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  4. Closures: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent sheet metal roofing.
- C. Concealed Gutters: Formed with 22 gage stainless steel sheet (Type 314/316). Match profiles indicated on the approved Shop Drawings; complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, sized according to SMACNA's "Architectural Sheet Metal Manual". Furnish gutter splices, expansion joints and other accessories fabricated from the same metal as gutters.
- D. Snow Guard System: Prefabricated, noncorrosive stainless steel units designed to be installed without penetrating sheet metal roofing, and complete with predrilled holes, clamps, or hooks for anchoring.
1. Snow guard system shall meet the specified performance criteria; and be installed in strict compliance with the manufacturer's recommendations and the approved Shop Drawings.
  2. Seam-Mounted, Bar-Type Snow Guards: Stainless steel rods or bars held in place by stainless steel clamps attached to vertical ribs of standing seam sheet metal roofing.
  3. Engineer snow guard system and supporting anchorage system to withstand a minimum load of 300 pounds per linear foot; unless otherwise indicated on the approved Shop Drawings; or greater loads are prescribed by authorities having jurisdiction.
- E. Pre-Engineered Fall Restraint System: Refer to Section 11010 – Fall Restraint Systems for materials and requirements.
- F. Ice Guard System: Prefabricated, noncorrosive stainless steel units designed to be installed without penetrating sheet metal roofing. Provide continuous bar mounted ice guards. Provide one ice guard per roof pan; centered between standing seams, clamped to horizontal support bars.

1. Provide snow/ice guard assemblies as manufactured by UMICORE Building Products, Inc., or approved equal.
  2. Provide ice guard assemblies at eaves, as indicated.
- G. Pipe Flashing: Unless otherwise indicated on Drawings, premolded EPDM pipe collar with flexible aluminum ring bonded to base.

## 2.06 FABRICATION

- A. General: Fabricate roll-formed steel metal roofing panels to comply with details shown and roll-formed sheet metal roofing manufacturer's written instructions.
1. Standing-Seam Roofing: Form standing-seam pans with finished seam height as indicated.
  2. Employ the manufacturer's standard back-coated sheet metal materials for both "low-slope" areas and assemblies located above heated/conditioned spaces as recommended by the roofing manufacturer; and as acceptable to the Commissioner.
- B. Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.
1. Lay out sheet metal roofing so cross seams, when required, are made in direction of flow with higher pans overlapping lower pans. Stagger cross seams.
  2. Fold and cleat eaves and transverse seams in the shop.
  3. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for leakproof construction.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant (concealed within joints).
- D. Sealant Joints: Where movable, nonexpansion joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturers of dissimilar metals or by fabricator.

## 2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface preparation, installation tolerances, sheet metal roofing supports, and other conditions affecting performance of work.
  - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed.
  - 2. Examine roof decking to verify that deck joints are supported by framing or blocking and that installation is within flatness tolerances.
  - 3. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for roof drains, flashings, and penetrations through sheet metal roofing.
  - 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before sheet metal roofing installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Verify field dimensions before fabrication. Notify Commissioner of any discrepancies between field measurements and dimensions indicated in Construction Documents.

- B. Insulation: Install insulation in accordance with manufacturer's written instructions with staggered seams. Comply with additional requirement of Section 07210 - Building Insulation.
- C. Secondary Membrane/Vapor Barrier (Self-Adhering Sheet) Underlayment: Install self-adhering sheet vapor barrier, wrinkle free, over insulation. Apply primer if required by underlayment manufacturer and compatible with insulation. Comply with temperature restrictions of vapor barrier manufacturer for installation; use primer for installing vapor barrier at low temperatures. Apply over entire roof area, in shingle fashion to shed water, with end laps not less than 3-1/2 inches. Extend underlayment below concealed gutter trough assemblies. Roll laps with roller. Cover within maximum time period allowed by vapor barrier manufacturer.
- D. Vent Course Layer: Install ventilation mat in accordance with manufacturer's written instructions.
  - 1. Place ventilation mat course horizontally, starting at the bottom of the roof and working up. Abut ventilation mat materials at end and side laps; do not overlap materials; fit snug to penetrations.
  - 2. At roof terminations (lowest point) leave enough ventilation mat (and self-adhering membrane materials) to extend materials over the facing edge. Make certain these ventilation mats are installed over the waterproof underlayments.
  - 3. At highest point in the roof assembly, terminate ventilation mat in accordance with the manufacturer's recommendations; and as acceptable to the Commissioner.
  - 4. Secure ventilation mat with either stainless steel fasteners or temperature resistant adhesives specifically designed for this purpose.
- E. Install flashings to cover underlayment to comply with requirements specified in Section 07620 - Sheet Metal Flashing and Trim.
- F. Red rosin paper is not permitted.

### 3.03 PERLITE BOARD INSTALLATION

- A. General: Coordinate installing sheet metal roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with sheet metal roofing manufacturer's written instructions for installing roof insulation.
- C. Install one or more layers of insulation under area of sheet metal roofing system to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

- D. Trim surface of insulation where necessary so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners; employ the roofing system manufacturer's recommended high density polyethylene "shield tubes" specifically designed to resist compressive forces on the roof insulation; sized for fastening specified board-type roof insulation to deck type.
  - 1. Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification; and in accordance with additional requirements of UL P740.
  - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

### 3.04 INSTALLATION, GENERAL

- A. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of sheet metal being fabricated and installed.
  - 1. Do not install in inclement weather.
  - 2. Do not install over a damp substrate.
  - 3. Do not install when inclement weather is threatening.
  - 4. If covering of zinc panels is required, provide free air flow around the zinc material to manufacturer's requirement to prevent white rust.
- B. Install sheet metal roofing in areas as shown on drawings, perpendicular to purlins or supports. Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install insulation, underlayments, fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.
  - 1. Field cutting of sheet metal roofing by torch is not permitted.
  - 2. Rigidly fasten eave end of sheet metal roofing and allow ridge end adequate movement to accommodate thermal expansion and contraction. Predrill roofing.



3. Provide metal closures at peaks rake edges rake walls and each side of ridge and hip caps.
  4. Flash and seal sheet metal roofing with weather closures are eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  5. Locate and space fastenings in uniform vertical and horizontal alignment.
  6. Install ridge and hip caps as sheet metal roofing work proceeds.
  7. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.
  8. Lap metal flashings over sheet metal roofing to shed water, allowing moisture to run over and off the material.
  9. Install back coated sheet metal roofing systems in accordance with the manufacturer's instructions, and the approved Shop Drawings.
- C. Install work to be truly straight and square or conform to curvilinear geometry indicated on drawings.
1. Fabricate and install work with lines and corners of exposed units true and accurate.
  2. Form exposed faces free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal.
  3. Shim and align panel units within installed tolerance of  $\frac{1}{4}$  inch in 20'-0".
  4. All seams shall be of uniform appearance and dimensions, straight and level with minimum exposure of solder and sealant.
  5. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.
  6. Form all seams to be weatherproof, leaving room for expansion and contraction with specified and required tolerances. Provide sealing tape to seams in areas prone to ice dams and continuously on roof slopes less than 10 degrees (2:12).
  7. Comply with manufacturer's recommendations and SMACNA "Architectural Sheet Metal Manual" for flashings and sheet metal work.
- D. Provide work as indicated on approved Shop Drawings.
1. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings and other components of metal roofing to

profiles, patterns, and drainage arrangements shown and as required for rainproof construction.

- E. Fasteners: Use fasteners of sizes that will not penetrate completely through fireproofing course at deck underside.
  - 1. Zinc Roofing: Use stainless steel fasteners.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing.
  - 1. Coat back side of sheet metal roofing with bituminous coating where roofing will contact wood, ferrous metal, or cementitious construction.
- G. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- H. Fascia: Align bottom of sheet metal roofing and fasten with blind bolts, or self-tapping screws. Flash and seal sheet metal roofing with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.05 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions and SMACNA'S "Architectural Sheet Metal Manual". Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type

expansion provisions cannot be used or would not be sufficiently weather resistant and water-proof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

- C. Concealed Gutters: Join sections with riveted and soldered or lapped and sealed joints. Secure gutter assemblies and flash in accordance with the approved Shop Drawings. Provide prefabricated expansion joint assemblies and seal watertight with sealant. Provide for thermal expansion.
- D. Snow and Ice Guard Assemblies: Attach bar supports to vertical rib of standing-seam sheet metal roofing with clamps or set screws. Do not use fasteners that will penetrate sheet metal roofing.
  - 1. Provide snow and ice guard assemblies in the locations and of the spacing as indicated on the approved Shop Drawings.
- E. Pipe Flashing: Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by manufacturer.

### 3.06 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of  $\frac{1}{4}$  inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.07 CLEANING AND PROTECTION

- A. Clean and exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films, if any, as sheet metal roofing is installed. On completion of sheet metal roofing installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Repair minor damages and defects of the metal roof panels and accessories in accordance with the manufacturer's instructions and recommendations. Field repairs shall be acceptable to the Commissioner.
  - 1. In the event that such repairs are not acceptable to the Commissioner, or if the damages are such that a field repair is not recommended by the manufacturer, provide replacement materials/panels identical to those originally installed; and as follows.

2. Replace panels that have been damaged, or have become deteriorated beyond successful repair (as judged by the Commissioner) by field touch-up and other such remedial procedures.

**-END OF SECTION-**

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**Section 07620**  
**SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following sheet metal flashing and trim:
  - 1. Formed wall flashing and trim
  - 2. Manufactured reglets
  - 3. Formed equipment support flashing

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 03450 - Plant- Precast Architectural Concrete
- C. Section 04201 - Unit Masonry
- D. Section 06100 - Rough Carpentry
- E. Section 07410 - Metal Wall Panels
- F. Section 07610 - Sheet Metal Roofing
- G. Section 07721 - Roof Hatches
- H. Section 07920 - Exterior Joint Sealants
- I. Section 08110 - Stainless Steel Doors and Frames
- J. Section 08342 - Overhead High Speed Fabric Doors
- K. Section 08520 - Aluminum Windows
- L. Section 08630 - Translucent Insulating Panels
- M. Section 10200 - Louvers and Screens
- N. Sections related Plumbing Work
- O. Sections related to HVAC Work
- P. Sections related to Electrical Work

**1.03 PERFORMANCE REQUIREMENTS**

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  1. Identify material, thickness, weight, and finish for each item and location in Project.
  2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
  4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
  2. Trim: 12 inches long. Include fasteners and other exposed accessories.
  3. Accessories: Full-size Sample

#### 1.05 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

1. Meet with Commissioner, City of New York's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, translucent panel clerestory materials, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.07 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

### PART 2 PRODUCTS

#### 2.01 SHEET METALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
  1. Finish: No. 4 (fine reflective, polished directional satin), unless otherwise acceptable to the Commissioner.
  2. Thickness: As indicated; if not indicated, not less than 24-gage

#### 2.02 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.



- B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
- C. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

## 2.03 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Stainless steel (type 316) wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
  - 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
  - 3. Blind Fasteners: High-strength Type 316 stainless-steel rivets.
- C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polysulfide polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.04 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory- mitered and -welded corners and junctions.
  - 1. Material: Stainless steel, 0.0187 inch thick.
  - 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
  - 3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
  - 4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  - 5. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
  - 6. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

## 2.05 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
  - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

## 2.06 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams. Fabricate from the following material:
  - 1. Stainless Steel: 0.0156 inch thick

## 2.07 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following material:
  - 1. Stainless Steel: 0.0187 inch thick

## 2.08 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
  - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
  - 1. Coat side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
  - 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
  1. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with butyl sealant as required for watertight construction.
  1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Section 07920 - Exterior Joint Sealants.
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
  1. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
  2. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

### 3.03 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
  1. Provide hemmed edges at exposed flashing terminations.
- B. Through-Wall Flashing: Installation of formed through-wall flashing is specified in Section 04201 - Unit Masonry.

- C. Reglets: Installation of reglets is specified in Section 03300 - Cast-in-Place Concrete.

#### 3.04 MISCELLANEOUS FLASHING INSTALLATION

- A. Roof Hatch and Equipment Support Flashing: Coordinate installation of roof hatch and equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to hatch frame and equipment support member.

#### 3.05 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder and sealants.
- B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond repair. Repair minor damages by finish touchup or similar minor repair procedures acceptable to the Commissioner.

- END OF SECTION -

NO TEXT ON THIS PAGE

**Section 07721**  
**ROOF HATCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES****A. This Section includes the following:**

1. Roof access hatches
2. Smoke actuated vent hatches

**1.02 RELATED SPECIFICATIONS**

- A. Section 05312 - Steel Roof Deck
- B. Section 05500 - Metal Fabrications
- C. Section 05521 - Exterior Pipe and Tube Railings
- D. Section 06100 - Rough Carpentry
- E. Section 07610 - Sheet Metal Roofing
- F. Section 07620 - Sheet Metal Flashing and Trim
- G. Section 09911 - Exterior Painting
- H. Sections related to HVAC Work
- I. Sections related to Electrical Work

**1.03 SUBMITTALS**

- A. **Product Data:** For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. **Shop Drawings:** Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. **Coordination Drawings:** Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
  1. Size and location of roof accessories specified in this Section.
  2. Method of attaching roof accessories to roof or building structure.
  3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
- D. **Samples:** For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color and finish.



- E. Warranty: Special warranty specified in this Section.

#### 1.04 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

#### 1.07 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

#### 1.08 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
  - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
  - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
  - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 PRODUCTS

## 2.01 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
  - 1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Conversion coating; Organic Coating: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.
    - a. Color and Gloss: Match Commissioner's sample.
- B. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M
- C. Galvanized Steel Pipe: ASTM A 53/A 53M

## 2.02 MISCELLANEOUS MATERIALS

- A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Polyethylene Sheet: 6-mil- thick, polyethylene sheet complying with ASTM D 4397
- D. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
  - 1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.
- E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.
- I. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

## 2.03 ROOF HATCHES

- A. Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
- B. Manufacturers
  - 1. Babcock-Davis; a Cierra Products Inc. Company
  - 2. Bilco Company (The)
  - 3. Dur-Red Products
  - 4. Milcor Inc.; a Gibraltar Company
  - 5. Or approved equal
- C. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
- D. Type and Size: Sizes as indicated.
- E. Curb and Lid Material: Aluminum sheet, 0.090 inch thick.
  - 1. Finish: High-performance organic coating.
- F. Insulation: Glass-fiber board
- G. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
- H. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
- I. Sloping Roofs: Fabricate hatch curbs with uniform height to match slope.
- J. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside.

## K. Ladder Safety Post

1. Performance Requirements: Fabricate safety post to comply with OSHA 1910.27 for fixed ladders. Must support 200 pound load.
2. Post to lock in place on full extension. Provide release mechanism to return post to closed position and a pull up loop at the upper end of the post to facilitate raising the post.
3. Spring assist: Stainless steel balancing spring mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.
4. Height: 42 inches above finished roof deck
5. Material and Finish: Stainless steel 304, mill finished
6. Hardware: Stainless steel 304
7. Diameter: Pipe with 1-5/8-inch OD tube
8. Manufacturers
  - a. Bilco Company (The)
  - b. Nystrom, Inc.
  - c. Or approved equal

## 2.04 SMOKE ACTUATED VENT HATCHES

- A. Smoke vents shall be manufacturer's standard hatch-type smoke vents with integral double-wall insulated curbs and frame, with welded or sealed mechanical corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-wall lid, continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms, UL-listed fusible links rated at 165 deg F, smoke-detection system, and stainless steel hardware including hinges, hold-open devices, and independent manual-release devices for inside and outside operation of lids.
- B. Manufacturers
  1. Babcock-Davis; a Cierra Products Inc. Company
  2. Bilco Company (The)
  3. Nystrom, Inc.
  4. Milcor Inc.; a Gibraltar Company
  5. Or approved equal

- C. Loads: Fabricate heat and smoke vent to withstand a minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. uplift.
  - 1. When release is actuated, lid shall open against 10-lbf/sq. ft. snow or wind load and lock in position.
- D. Types and Sizes: As indicated on the Drawings.
- E. Regulatory Requirements: UL 793 and NFPA 204, unless otherwise acceptable to the authorities having jurisdiction.
- F. Smoke Vent Compliance: Provide units that have been tested and UL Listed and FMG approved.
- G. Fire Resistance of Lids: UL Class A rating
- H. Integral Curb, Framing, and Lid Material: Manufacturer's standard 11 gage aluminum sheet material; with all seams fully welded, stiffened and formed with self-flashing curbs.
  - 1. Finish: Manufacturer's standard mill finish, unless otherwise directed by the Commissioner.
- I. Insulation: Manufacturer's standard rigid fiberboard at curb perimeter; and polystyrene in cover assemblies.
- J. Fabricate integral curbs to minimum height of 12 inches, unless otherwise indicated.
- K. Sloping Roofs: Fabricate hatch curbs with uniform height to match slope.
- L. Hardware: Provide the manufacturer's standard stainless steel hardware including, but not limited to, heavy-duty hinges with non-removable pins, positive hold-release type latch mechanisms, electric/thermal resettable links interfaced with building alarm system, heavy-duty compression springs, heavy-duty shock absorbers, and continuous EPDM gaskets/weatherseals.
- M. Selected Product: Subject to compliance with requirements, provide smoke actuated vent assemblies "Model B-SVA" as manufactured by Babcock-Davis, or equivalent acceptable to the Commissioner by one of the specified manufacturers.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
  - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.

2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  1. Coat concealed side of uncoated aluminum and stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
  3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Hatch Installation:
  1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
  2. Attach safety railing system to roof hatch curb.
  3. Attach ladder safety post according to manufacturer's written instructions.
- F. Smoke Actuated Vent Hatch Installation:
  1. Check smoke hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.

2. Attach safety railing system to roof hatch curb.
3. Coordinate the installation of the smoke actuated vent hatch interlock system with the fire alarm system specified in other sections.

- G. Seal joints with elastomeric or butyl sealant as required by manufacturer of roof accessories.

### 3.03 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 09911 – Exterior Painting.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### 3.04 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

-END OF SECTION-

**Section 07811**  
**SPRAYED FIRE-RESISTIVE MATERIALS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
1. Sprayed cementitious fire-resistive materials
  2. Sprayed intumescent mastic fire-resistive materials
  3. Topcoats
  4. Sealers
  5. Expanded metal lath for support of sprayed cementitious fireproofing

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete and Section 03350 - Concrete Finishes, for concrete protecting structural steel
- B. Section 04201 - Unit Masonry, for masonry protecting structural steel
- C. Section 05120 - Structural Steel
- D. Section 05312 - Steel Roof Deck, for surface conditions receiving sprayed fire-resistive materials
- E. Section 07842 - Fire-Resistive Joint Systems, for fire-resistance-rated joint systems
- F. Section 09260 - Gypsum Board Assemblies

**1.03 DEFINITIONS**

- A. Concealed Sprayed Fire-Resistive Materials: Applied to surfaces that are concealed from view behind other construction when the Work is completed.
- B. Exposed Sprayed Fire-Resistive Materials: Applied to surfaces that are exposed to view when the Work is completed and surfaces that are accessible through acoustical metal panel ceilings.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.
1. Provide listed UL assemblies for each application indicated.
- B. Shop Drawings: Structural framing plans indicating the following:
1. Locations and types of surface preparations required before applying sprayed fire-resistive material.



2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
    - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
    - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
    - c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3. All sprayed fire resistive material applications shall be considered as restrained unless noted otherwise as determined by a qualified professional engineer.
  3. Treatment of sprayed fire-resistive material after application.
- C. Samples for Initial Selection: For each type of colored, exposed sprayed fire-resistive material indicated.
  - D. Samples for Verification: For each type of colored, exposed sprayed fire-resistive material, two Samples, each 4 inches (102 mm) square, of each color, texture, and material formulation to be applied. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
  - E. Product Certificates: For each type of sprayed fire-resistive material, signed by product manufacturer.
  - F. Qualification Data: For Installer, manufacturer, professional engineer and testing agency.
  - G. Compatibility and Adhesion Test Reports: From sprayed fire-resistive material manufacturer indicating the following:
    1. Materials have been tested for bond with substrates.
    2. Materials have been verified by sprayed fire-resistive material manufacturer to be compatible with substrate primers and coatings.
    3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
  - H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed sprayed fire-resistive materials.
  - I. Research/Evaluation Reports: For sprayed fire-resistive materials.
  - J. Warranties: Special warranties specified in this Section.

## 1.05 QUALITY ASSURANCE

- A. **Installer Qualifications:** A firm or individual certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
  - 1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.
- B. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. **Source Limitations:** Obtain sprayed fire-resistive materials through one source from a single manufacturer.
- D. **Sprayed Fire-Resistive Materials Testing:** By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.
  - 1. Sprayed fire-resistive materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 2. Testing is performed on specimens of sprayed fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
  - 3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
- E. **Compatibility and Adhesion Testing:** Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
  - 1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.

2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with sprayed fire-resistive material.
- F. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing sprayed fire-resistive materials with appropriate markings of applicable testing and inspecting agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection tested per ASTM E 119.
  2. Surface-Burning Characteristics: ASTM E 84.
- G. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- H. Mockups: Apply mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution and set quality standard for fabrication and installation.
1. Locations of Mockups: To be selected by the Commissioner.
  2. Extent of Mockups: Approximately 100 sq. ft. (9 sq. m) of surface for each product indicated.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination. Review methods and procedures related to sprayed fire-resistive materials including, but not limited to, the following:
1. Review and finalize construction schedule and verify sequencing and coordination requirements.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- C. Store materials inside, under cover, aboveground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat is provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

#### 1.08 COORDINATION

- A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
  - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
  - 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
  - 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
  - 4. Do not apply fire-resistive material to metal deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
  - 5. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
  - 6. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
  - 7. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

## 1.09 WARRANTY

- A. Special Warranty: Each product manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistive materials from substrates.
  2. Not covered under the warranty are failures due to damage by occupants and the City's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
- B. Warranty Period: Two years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 SPRAYED CEMENTITIOUS FIRE-RESISTIVE MATERIALS

- A. General: For applications of sprayed cementitious fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.
- B. Products
1. Carbolite Company Pyrocrete 40 or Pyrocrete 239 (exterior listing)
  2. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6s or Type Z146 (exterior listing)
  3. Arabian Vermiculite Industries – Type MK-6/CBF, MK-6/ED, MK-6/AY
  4. Grace Korea Inc. – Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6S
  5. Or approved equal
- C. Material Composition: Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 28 lb/cu. ft. or 40 lb/cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria as outlined in UL Design P739 or P740 and as per installation procedure outlined in AWCI Tech Manual 12-A but not less than 0.375 inch (9 mm), per ASTM E 605:
  - a. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
  - b. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch (9 mm) or 75 percent of the design thickness.
  - c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft. (240 kg/cu. m).
3. Bond Strength: 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736 under the following conditions:
  - a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
  - b. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
  - c. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).
5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.000 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - a. Flame-Spread Index: 10 or less
  - b. Smoke-Developed Index: 0
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

## 2.02 INTUMESCENT MASTIC FIRE-RESISTIVE COATINGS

### A. Available Products

1. Fire-Resistive, Water-Based Intumescent Mastic Coating Material
  - a. A/D Fire Protection Systems Inc.; Firefilm II and Colorcoat
  - b. Albi Manufacturing, Division of StanChem Inc.; Albi Clad TF or 800
  - c. Carbolite Co., Fireproofing Products Div.; Nullifire S606 and Topseal or Nullifire, UL test design X629
  - d. Isolatek International Corp., Cafco Products; Cafco SprayFilm-WB II Basecoat and Topseal
  - e. Or approved equal

### B. Thin-Film Fire-Resistive Intumescent Mastic Coating: Factory-mixed formulation, exterior grade only.

1. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction for interior use.
2. Multicomponent system consisting of intumescent base coat and topcoat.
3. Provide primer as recommended by product manufacturer.

### C. Color and Gloss: As selected by the Commissioner from manufacturer's full range.

## 2.03 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
  - 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory," for coating materials based on a series of bond tests per ASTM E 736.
  - 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.
- D. Galvanized Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.
- E. Reinforcing Fabric: Glass-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated, approved by manufacturer of intumescent mastic coating fire-resistive material.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance designs indicated, approved by manufacturer of intumescent mastic coating fire-resistive material. Include pins and attachment.
- G. Topcoat: Type recommended in writing by manufacturer of each sprayed fire-resistive material for application over exposed sprayed fire-resistive materials.
- H. Cement-Based Topcoat: Factory-mixed, cementitious hardcoat formulation recommended in writing by manufacturer of sprayed fire-resistive materials for trowel or spray application over exposed sprayed fire-resistive materials.



## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
  - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
  - 2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
  - 3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and encapsulants.
- C. Prime substrates where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive sprayed fire-resistive material.
- D. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

## 3.03 INSTALLATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Install metal lath as indicated, and as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.
- D. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.
- E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.
- F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.
- G. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire-resistive material over which they are applied.

## 3.04 INSTALLATION, CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

- A. Apply concealed sprayed fire-resistive material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities where specified in Part 2 "Sprayed Fire-Resistive Materials" Article.
- B. Apply sealer to concealed sprayed fire-resistive material where recommended by manufacturer.
- C. Apply topcoat to concealed sprayed fire-resistive material where recommended by manufacturer.

## 3.05 INSTALLATION, EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

- A. Apply exposed sprayed fire-resistive material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if indicated.
  - 1. For steel beams and bracing, provide a thickness of not less than 1 inch (25 mm).
  - 2. For metal floor or roof decks, provide a thickness of not less than 1/2 inch (13 mm).
- B. Provide a uniform finish complying with description indicated for each type of material and matching the Commissioner's sample or, if none, finish approved for field-erected mockup.
- C. Apply exposed cementitious sprayed fire-resistive material to produce the following finish:
  - 1. Even, spray-textured finish, produced by rolling flat surfaces of fire-protected members with a damp paint roller to remove drippings and excessive roughness.
- D. Apply intumescent mastic fire-resistive coating as follows:
  - 1. Install reinforcing fabric as required to obtain designated fire-resistance rating.
- E. Apply thin-film intumescent mastic fire-resistive coating as follows:
  - 1. Finish: Spray apply successive base coat(s) and finish topcoat. Allow to dry and cure between coats. Before applying finish topcoat, determine required dry film thickness according to manufacturers written recommendations.
  - 2. Finish: Spray application with surface lightly rolled before drying to smooth out surface irregularities and to seal in surface fibers.
- F. Cure exposed cementitious sprayed fire-resistive material according to product manufacturer's written recommendations to prevent premature drying.

## 3.06 FIELD QUALITY CONTROL

- A. Testing Agency: The City will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
  - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

- B. Testing Services: Testing and inspecting of completed applications of sprayed fire-resistive material shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. (93-sq. m) area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. (0.093-sq. m) sample area, with sample width of not less than 6 inches (152 mm) per ASTM E 605.
  2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
  3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
  4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. (929 sq. m) area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
  5. If testing finds applications of sprayed fire-resistive material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
- C. Remove and replace applications of sprayed fire-resistive material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.
- D. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas.
- D. Repair or replace work that has not been successfully protected.

-END OF SECTION-

**Section 07842**  
**FIRE-RESISTIVE JOINT SYSTEMS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes fire-resistive joint systems for the following:

1. Head-of-wall joints
2. Wall-to-wall joints
3. Floor, wall and ceiling penetration firestopping

**1.02 RELATED SPECIFICATIONS**

- A. Section 07610 – Sheet Metal Roofing, for fire-resistive roof expansion assemblies.
- B. Section 07921 - Interior Sealants, for non-fire-resistive joint sealants.
- C. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

**1.03 PERFORMANCE REQUIREMENTS**

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
1. Comply with applicable requirements of the NYC Building Code.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.
1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by UBC Standard 26-9 and NFPA 285 and UL 2079.
1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
  - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Research/Evaluation Reports: Each type of fire-resistive joint system must comply with requirements of the NYC Building Code.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Article 1.03 Performance Requirements:
  - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
  - 2. Fire-resistive joint systems are identical to those tested per methods indicated in Article 1.03 Performance Requirements and comply with the following:
    - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

- b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

#### 1.08 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify City of New York's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until City of New York's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Fire-Resistive Joint System Schedule at the end of Part 3.



## 2.02 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Article 1.03 Performance Requirements. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

### 3.03 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Article 1.03 Performance Requirements and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.04 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
- B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
  - 1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

## 3.05 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

## 3.06 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.
- B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG.
- C. Head-of-Wall Fire-Resistive Joint Systems FRJS-1
  - 1. Available UL-Classified Systems: HW-D-0041
  - 2. Assembly Rating: 2 hour
  - 3. Nominal Joint Width: 1 In.
  - 4. Movement Capabilities: Class II—12.5 percent compression or extension
- D. Head-of-Wall Fire-Resistive Joint Systems FRJS-2
  - 1. Available UL-Classified Systems: HW-D-0149
  - 2. Assembly Rating: 2 hours
  - 3. Nominal Joint Width: 1 In.
  - 4. Movement Capabilities: Class II - 25 percent compression or extension
- E. Wall-to-Wall Fire-Resistive Joint Systems FRJS-6
  - 1. Available UL-Classified Systems: WW- D-0027
  - 2. Assembly Rating: 1 hour
  - 3. Joint Width: 1 In Max
  - 4. Movement Capabilities: Class II – 12.5 percent compression or extension

F. Through-Penetration Fire Stop Systems TPFSRS-1

1. Available UL-Classified Through Penetration Fire Stop Systems: W-J- 7007
  - a. Integrity Rating: 2 hours
  - b. Insulation Rating: 1/2 hour
  - c. Maximum Area Opening: 73.7 sq ft

G. Through-Penetration Fire Stop Systems TPFSRS-2:

1. Available UL-Classified Through Penetration Fire Stop Systems: C-AJ-1393
  - a. Integrity Rating: 2 hours
  - b. Temperature Rating: 0 hours
  - c. L-Rating at Ambient Temperature: Less than 1 cfm/sq ft.
  - d. L-Rating at 400 deg F: 3 cfm/sq ft
  - e. W rating Class 1

H. Through-Penetration Fire Stop Systems TPFSRS-3:

1. Available UL-Classified Through Penetration Fire Stop Systems: C-AJ-1402
  - a. Integrity Rating: 2 hours
  - b. Temperature Rating: 0 hours

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 07845**  
**ANNULAR SPACE SEALS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes sealants for interior joints applications. Fire rated and non-fire rated sealant specifications are included in this section. For fire rated sealants the Contractor must furnish and install mechanical cable, conduit and pipe sealing system in order to prevent the passage of fire smoke, gasses, dust and water.
  - 1. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Vertical joint on exposed surfaces of interior unit masonry, concrete walls and partitions, metal wall panels and translucent insulating panels.
    - c. Perimeter joint between built-in casework, countertops and interior wall surfaces and frames of interior doors and windows.
    - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - e. Other joint as indicated.
  - 2. Interior joints in the following horizontal traffic surfaces:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 – Cast in Place Concrete
- B. Section 04201 – Unit Masonry
- C. Section 13915 – Fire-Suppression Piping
- D. Section 15430 – Plumbing Specialties
- E. Section 16742 – Radio Communications System
- F. Section 16752 – Digital Video System

## 1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM) standard test methods for:
  - 1. ASTM E84: Surface Burning Characteristics of Building Materials
  - 2. ASTM E119: Fire Tests of Building Construction and Materials
  - 3. ASTM E814: Fire Tests of Through-Penetration Fire stops
- B. Underwriters Laboratories Inc.
  - 1. UL 263: Fire Test of Building Construction Materials
  - 2. UL 723: Surface Burning Characteristics Test of Building Materials
  - 3. UL 1479: Fire Test of Through-Penetration Firestops
- C. National Fire Protection Association (NFPA)
  - 1. NFPA 70: National Electrical Code
  - 2. NFPA 101: Life Safety Code
- D. National Electrical Manufacturers Association (NEMRA)
  - 1. NEMA Standard 1-10-79 For Type 1-6p and 11-13 Enclosures
- E. Pipe Seals shall conform to the New York City Building Code in respect to plumbing and other applications covered by these codes.

## 1.04 SUBMITTALS

- A. Product Data: For each join-sealant product indicated
- B. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- C. Sample for Verification: For each type and color of joint sealants required, provide samples with joint sealants in ½ inch- wide joints formed between two 6 inch long strips of material matching the appearance of exposed adjacent to joint sealants.
- D. Submit working drawings, shop drawings and material specifications including, but not limited to:
  - 1. Locations where pipe seals will be placed
  - 2. Catalog data for stayplates, screws, and compression system
  - 3. Other seal appurtenances

## 1.05 QUALITY ASSURANCE

- A. The pipe seals covered by these Specifications shall be provided by the Contractor through qualified manufacturers experienced in the fabrication and manufacture of the pipe seals specified herein. The pipe seals shall be designed, fabricated and installed in accordance with the standards specified.
- B. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of sealants required for this project.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the Notice to Proceed with the Work.
  - 1. Testing Agency Qualification: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  - 2. Test joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- D. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint surfaces as follows:
  - 1. Locate test joints where indicated on Contract Drawings or, if not indicated, as directed by the Commissioner.
  - 2. Conduct field tests for each type of sealant and joint surface indicated
  - 3. Notify the Commissioner seven days in advance of dates and times when test joints will be erected.
  - 4. Arrange for test to take place with joint-sealant manufacturer's technical representative present.
    - a. Test method: Test joint sealant according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
      - (1) For joints with dissimilar surfaces, verify adhesion to each surface separately; extend cut along on side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  - 5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint surface or tore cohesively. Include data on pull distance used to test each type of product and joint surface. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.



6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint surface during testing.

## 1.06 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealant under the following conditions:
  1. When ambient and surface temperature conditions are outside limited permitted by join-sealant manufacturer.
  2. When joint surfaces are wet.
  3. Where joint widths are less than those allowed by manufacturer for applications indicated.
  4. Contaminates capable of interfering with adhesion have not yet been removed from joint surfaces.

## 1.07 GUARANTEE

- A. Special Installer's Guarantee: Installer's standard form in which Installer agrees to repair or replace joint seals that do not comply with performance and other requirements specified in this Section within specified guarantee period.
  1. Guarantee Period: One (1) year from date of Substantial Completion

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. System consists of stainless steel frame, compression mechanism, and stayplates. The system must be adaptable to several sizes of pipe diameters.
- B. Pipes seals must prevent the passage of fire, water smoke, gasses, and rodents.
- C. Any lubricant needed for proper installation must be non-corrosive to pipe material and supplied by the pipe seal vendor.

### 2.02 SYSTEM REQUIREMENTS

- A. Fire Rated Seals
  1. Designs selected for installation shall provide a fire resistance rating that is at least 2 hrs and/or equal to the hourly resistance rating of the floor, wall or partition into which the firestop design will be installed.

2. Designs should also have a L Rating ( $CF/FT^2$ ) of  $<1$  at Ambient and  $<1$  at  $400^\circ$
3. Sealing system should be water-tight 4 bar/58 psi.
4. Sealing system must be Halogen free.
5. Design should provide pipe retention support of 170 lbs or more per pipe.
6. Acceptable pipe seal vendors include:
  - a. Roxtec, Inc; G 2x2 AISI 316, Wedge 120 mm AISI 316, TSL 15x6 Rubber Strip, Stayplates 120 mm AISI 316, RM 30.
  - b. Or approved equal.

B. Non-Fire Rated Seals

1. Designs selected for installation shall provide prevent the passage water, gasses, and rodents.
2. Sealing system should be water-tight to 4 bar/58 psi.
3. Sealing system must be Halogen free.
4. Design should provide pipe retention support of 170 lbs or more per pipe.
5. Acceptable pipe seal vendors include:
  - a. Roxtec, Inc; North Kingstown, RI
  - b. Link-Seal, Thunderline Corporation, Wayne, MI
  - c. Or approved equal

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Examine joints indicated to receive pipe seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after all non-satisfactory conditions have been satisfied.

### 3.02 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing seals to comply with joint-seal manufacturer's written instruction and the following requirements:
1. Remove all foreign material from joint surfaces that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by seal manufacturer), old joint seals, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound surface capable of developing optimum bond with seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    - a. Concrete
    - b. Masonry
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm surfaces, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint surfaces include the following:
    - a. Metal
    - b. Glass
    - c. Glazed surfaces or ceramic tile
- B. **Joint Priming:** Prime joint surfaces where recommended in writing by joint-seal manufacturer based on preconstruction joint-surface testing. Apply primer to comply with joint-seal manufacturer's written instructions. Continue primers to areas of joint-seal bond; do not allow spillage or migration onto adjoining surfaces.

### 3.03 INSTALLATION

- A. **General:** Comply with joint-seal manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
1. Installation of Mechanical System does not require the qualification by the manufacturer. Installation shall be performed in accordance with manufacturer's detailed installation procedures.

- B. Seal Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install seals backings of type indicated to support seals during installation and at position required to produce cross-sectional shapes and depths of installed seals relative to joint widths that allow optimum seal movement capabilities.
  - 1. Do not leave gaps between ends of seal and seal backing
  - 2. Do not stretch, twist, puncture, or tear seal backing.
  - 3. Remove absorbent seal backings that have become wet before seal application and replace them with dry materials
- D. Install bond-beaker tape behind seals where seal backing are not used between sales and back of joints.

#### 3.04 FIELD QUALITY CONTROL

- A. Prepare and install system in accordance with manufacturer's printing instructions and recommendations
- B. Inspect the system to ensure that the system is installed per manufacturer's instruction.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 07920**  
**EXTERIOR JOINT SEALANTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes joint sealants for the exterior joints in the following vertical surfaces and horizontal non-traffic surfaces, including those specified by reference to this Section:
1. Construction joints in cast-in-place concrete
  2. Joints between plant-precast architectural concrete units
  3. Control and expansion joints in unit masonry
  4. Joints between metal panels
  5. Joints between different materials listed above
  6. Perimeter joints between materials listed above and frames of doors, windows and louvers
  7. Control and expansion joints
  8. Other joints as indicated

**1.02 RELATED SPECIFICATIONS**

- A. Section 04201 - Unit Masonry
- B. Section 07410 - Metal Wall Panels
- C. Section 07610 - Sheet Metal Roofing
- D. Section 07620 - Sheet Metal Flashing and Trim
- E. Section 07842 - Fire Resistive Joint Systems
- F. Section 07721 - Roof Hatches
- G. Section 08110 - Stainless Steel Doors and Frames
- H. Section 08520 - Aluminum Windows
- I. Section 08630 - Translucent Insulating Panels
- J. Section 08800 - Glazing
- K. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

## 1.04 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. Sealant, Waterproofing & Restoration Institute (SWRI) Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer and testing agency.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- I. Warranties: Special warranties specified in this Section.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
  3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
  4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- E. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.



- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

## 1.06 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.07 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles and listed in other related sections of these specifications.

### 2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Match Commissioner's samples.

### 2.03 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Single-Component Neutral-Curing Silicone Sealant:
  - 1. Available Products
    - a. Dow Corning Corporation; 790
    - b. GE Silicones; SilPruf LM SCS2700
    - c. Or approved equal
  - 2. Type and Grade: S (single component) and NS (nonsag)
  - 3. Class: 100/50
  - 4. Use Related to Exposure: NT (nontraffic)
  - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O
  - 6. Stain-Test-Response Characteristics: Non-staining to porous substrates per ASTM C 1248

#### 2.04 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

#### 2.05 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete
    - b. Masonry
    - c. Unglazed surfaces of ceramic tile
  - 3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - a. Metal
  - b. Glass
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

3.04 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

-END OF SECTION-

**Section 07921**  
**INTERIOR SEALANTS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes sealants for interior joints applications indicated in the Joint Sealant Schedule at the end of Part 3.

1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
  - a. Vertical control and expansion joints on exposed interior surfaces of exterior walls.
  - b. Interior perimeter joints of exterior openings.
  - c. Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
  - d. Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
  - e. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
  - f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - g. Joints between built-in casework and countertops and walls
  - h. Other joints as indicated.
2. Interior joints in the following horizontal traffic surfaces:
  - a. Isolation joints in cast-in-place concrete slabs.
  - b. Other joints as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 04201 - Unit Masonry, for masonry control and expansion joint fillers and gaskets.
- B. Section 07842 - Fire-Resistive Joint Systems, for sealing joints in fire-resistance-rated construction.
- C. Section 07920 - Exterior Joint Sealants, for sealing joints in exterior applications indicated.

- D. Section 08800 - Glazing, for glazing sealants.
- E. Section 09310 - Ceramic Tile, for sealing tile joints.
- F. Section 09513 - Acoustical Snap-In Metal Pan Ceilings, for sealing edge moldings at perimeters of acoustical ceilings.
- G. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

### 1.03 PERFORMANCE REQUIREMENTS

- A. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 1.04 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer and testing agency.
- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

- I. Field Test Report Log: For each elastomeric sealant application.
- J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- K. Warranties: Special warranties specified in this Section.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the Notice to Proceed with the Work.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.



2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
  3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by the Commissioner.
  2. Conduct field tests for each type of elastomeric sealant and joint substrate indicated.
  3. Notify the Commissioner seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
      - (1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

#### 1.06 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  2. When joint substrates are wet.
  3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.07 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by the Commissioner from manufacturer's full range.

#### 2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those

referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Comply with joint-sealant manufacturer's written installation instructions. See Part 3.03.
- F. Multicomponent Nonsag Polysulfide Sealant ES-1

- 1. Products

- a. Pacific Polymers, Inc.; Elasto-Seal 227 Type II (Gun Grade)
- b. Pecora Corporation; Synthacalk GC-2+
- c. Polymeric Systems Inc.; PSI-350
- d. PolySpec Corp.; T-2235-M
- e. PolySpec Corp.; T-2282
- f. PolySpec Corp.; Thiokol 2P
- g. Sonneborn, Division of ChemRex Inc.; Sonolastic Polysulfide Sealant
- h. Or approved equal

- 2. Type and Grade: M (multicomponent) and NS (nonsag)

- 3. Class: 25

- 4. Uses Related to Exposure: T (traffic) and NT (nontraffic)

- 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O

- a. Use O Joint Substrates: concrete and cmu substrates

## G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-3:

1. Products
  - a. Pecora Corporation; 898
  - b. Tremco; Tremsil 600 White
  - c. Or approved equal
2. Type and Grade: S (single component) and NS (nonsag)
3. Class: 25
4. Use Related to Exposure: NT (nontraffic)
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O
  - a. Use O Joint Substrates: concrete and cmu substrates

## H. Multicomponent Nonsag Urethane Sealant ES-2:

1. Products
  - a. Pecora Corporation; Dynatrol II
  - b. Tremco; Dymeric 511
  - c. Tremco; Vulkem 922
  - d. Or approved equal
2. Type and Grade: M (multicomponent) and NS (nonsag)
3. Class: 50
4. Uses Related to Exposure: NT (nontraffic) and T (traffic)
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: concrete and cmu substrates.

## 2.03 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for

joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.04 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility

by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete
    - b. Masonry
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal
    - b. Glass
    - c. Glazed surfaces of ceramic tile
- B. Joint Priming: Prime joint substrates where recommended in writing by joint-sealant manufacturer based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- 3.03 INSTALLATION OF JOINT SEALANTS
- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
  - B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
  - C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  - 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
  - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

- I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
  1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
  2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch . Hold edge of sealant bead 1/4 inch inside masking tape.
  3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
  4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

### 3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
    - b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.



3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:
  - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
  - b. Whether sealants filled joint cavities and are free of voids.
  - c. Whether sealant dimensions and configurations comply with specified requirements.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.05 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.06 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.07 JOINT SEALANT SCHEDULE

- A. Joint Sealant Application JS-1: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant ES-1.
  - 2. Joint-Sealant Color: As selected by the Commissioner from manufacturer's full range.
- B. Joint Sealant Application JS-2: Interior perimeter joints of exterior openings.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant ES-1.
  - 2. Joint-Sealant Color: As selected by the Commissioner from manufacturer's full range.
- C. Joint Sealant Application JS-3: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
  - 1. Joint Sealant: Multicomponent nonsag urethane sealant ES-2.
  - 2. Joint-Sealant Color: As selected by the Commissioner from manufacturer's full range.
- D. Joint Sealant Application JS-4: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
  - 1. Joint Sealant: Single-component mildew-resistant neutral -curing silicone sealant ES-3.
  - 2. Joint Sealant Color: As selected by the Commissioner from manufacturer's full range.
- E. Joint Sealant Application JS-5: Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
  - 1. Joint Sealant: Multicomponent non-sag polysulfide sealant ES-1.
  - 2. Joint Sealant Color: As selected by the Commissioner from manufacturer's full range.
- F. Joint Sealant Application JS-6: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 1. Joint Sealant: Multicomponent non-sag polysulfide sealant ES-1.
  - 2. Joint Sealant Color: As selected by the Commissioner from manufacturer's full range.

- G. Joint Sealant Application JS-7: Joints between built-in casework and countertops and walls.
1. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant ES-3.
  2. Joint Sealant Color: As selected by the Commissioner from manufacturer's full range.

-END OF SECTION-

**Section 08110**  
**STAINLESS STEEL DOORS AND FRAMES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

A. This Section includes the following for highly corrosive applications:

1. Stainless-steel, hollow-metal doors
2. Stainless-steel, hollow-metal frames

**1.02 RELATED SPECIFICATIONS**

- A. Section 04201 –Unit Masonry
- B. Section 08711 –Door Hardware
- C. Sections related to Electrical and Access Systems
- D. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

**1.03 DEFINITIONS**

- A. Stainless-Steel Sheet Thicknesses: Indicated as the specified thicknesses for which over- and under-thickness tolerances apply, according to ASTM A 480/A 480M.

**1.04 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of stainless-steel door and frame specified.
- B. Shop Drawings: In addition to requirements below, provide a schedule of stainless-steel doors and frames using same reference numbers for details and openings as those on Drawings:
  1. Elevations of each door design
  2. Details of doors, including vertical and horizontal edge details
  3. Frame details for each frame type, including dimensioned profiles
  4. Details and locations of reinforcement and preparations for hardware
  5. Details of each different wall opening condition
  6. Details of anchorages, accessories, joints, and connections
  7. Details of glazing frames and stops showing glazing
  8. Details of conduit and preparations for electrified door hardware and controls

- C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power, signal, and electrified control systems.
- D. Samples for Verification: For each type of exposed finish required.
- E. Construction Samples: 12- by-12-inch corner section representing the specified construction of stainless-steel doors and frames to be furnished by manufacturer.
  - 1. Doors: Show vertical-edge, top, and internal construction; and hinge and other door hardware reinforcement.
    - a. Include glazing stops, with stops applied to show corner joint.
  - 2. Frames: Show welded corner joint at head to jamb; and hinge mortise and reinforcement.
    - a. Include glazing stops, with stops applied to show corner joint.
- F. Oversize Construction Certification: For stainless-steel door assemblies required to be fire rated and exceeding limitations of labeled assemblies; include statement that doors comply with requirements of design, materials, and construction but have not been subjected to fire test.
- G. Qualification Data: For testing agency
- H. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of stainless-steel door and frame.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain stainless-steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to ASTM E 152 per NYC Building Code and NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
  2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.
  3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.
- E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with ASTM E 152 per NYC Building Code and NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch high, wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
  1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating stainless-steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.08 COORDINATION

- A. Coordinate installation of anchorages for stainless-steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. American Steel Products, Inc.
  - 2. Ceco Door Products; an ASSA ABLOY Group Company
  - 3. National Custom Hollow Metal Doors & Frames
  - 4. Pioneer Industries, Inc.
  - 5. Steelcraft; an Ingersoll-Rand Company
  - 6. Or approved equal

## 2.02 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, austenitic stainless steel, Type indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 zinc-iron-alloy (galvannealed) coating designation.
- E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching stainless-steel door frames of type indicated.
- H. Grout: Comply with Section 04201-Unit Masonry.

- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 08800 - Glazing.
- K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.03 STAINLESS STEEL DOORS

- A. General: Provide flush-design doors, not less than 1-3/4 inches thick, of seamless hollow construction, unless otherwise indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces.
  - 1. Visible joints or seams around glazed lite inserts are permitted.
  - 2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches.
  - 3. For double-acting swing doors, round vertical edges with 2-1/8-inch radius.
- B. Face Sheets: Fabricated from minimum 0.042-inch- thick, stainless-steel sheet, Type as follows:
  - 1. Doors for Highly Corrosive Applications: Type 316
- C. Core Construction: Fabricate doors with core indicated. Provide thermal-resistance-rated cores for exterior doors and interior doors where indicated.
  - 1. Steel-Stiffened Core: 0.026-inch- thick, stainless steel vertical stiffeners extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.
  - 2. Fire-Rated Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
- D. Top and Bottom Channels: Minimum 0.053-inch- thick, stainless steel channel spot welded, not more than 6 inches o.c., to face sheets.
  - 1. Top and bottom edges closed with closing channels of same material and thickness as face sheets; welded so webs of channels are flush with door edges.



- E. Hardware Reinforcement: Fabricate reinforcement plates from stainless steel as indicated in Part 2 "Fabrication" Article, to comply with the following minimum sizes:
1. Hinges and Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.093 inch thick.
  3. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- F. Hardware Enclosures: Provide enclosures and junction boxes within doors for electrically operated door hardware, interconnected with UL-approved, 1/2-inch-diameter conduit and connectors.
1. Where indicated for installation of wiring, provide access plates to junction boxes, fabricated from same material and thickness as face sheet and fastened with at least 4 security fasteners spaced not more than 6 inches o.c.

## 2.04 STAINLESS STEEL FRAMES

- A. General: Fabricate frames of construction indicated, with faces of corners mitered and contact edges closed tight.
1. Frames for Doors: Welded
  2. Door Frames for Openings 48 Inches Wide or Less: Fabricated from 0.053-inch-thick, stainless-steel sheet
  3. Door Frames for Openings More Than 48 Inches Wide: Fabricated from 0.067-inch-thick, stainless-steel sheet
- B. Material: Fabricate frames from stainless-steel sheet, Type as follows:
1. Frames for Highly Corrosive Applications: Type 316
- C. Hardware Reinforcement: Fabricate reinforcement plates from stainless steel, as indicated in Part 2 "Fabrication" Article, to comply with the following minimum sizes:
1. Hinges and Pivots: Minimum 0.167 inch thick by 1-1/4 inches wide by 10 inches long, secured by not less than 6 spot welds
  2. Strikes, Flush Bolts, Hold-Open Arms, and Closers: Minimum 0.093 inch thick

3. Surface-Mounted Hardware: Minimum 0.093 inch thick
- D. Head Reinforcement: Minimum 0.093-inch- thick, stainless steel channel or angle stiffener.
- E. Jamb Anchors: Formed from material indicated in Part 2 "Fabrication" Article.
  1. Masonry Type: T-shaped anchors to suit frame size, not less than 0.053 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
  2. Compression Type for Slip-on Frames: Adjustable compression anchors
  3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- F. Floor Anchors: Formed from material indicated in Part 2 "Fabrication" Article, not less than 0.067 inch thick, and as follows:
  1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners
  2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.05 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with stainless-steel frames, minimum 5/8-inch high, unless otherwise indicated.
- C. Loose Stops for Glazed Lites and Solid Panels in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

## 2.06 FABRICATION

- A. General: Fabricate stainless-steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Stainless-Steel Doors: Comply with ANSI A250.4, Level A.

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Edges: Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth, flush surfaces with no visible seams.
4. Doors for Highly Corrosive Applications: Fabricate doors with door faces and internal components, including stiffeners and hardware reinforcements, from Type 316 stainless-steel sheet.

C. Stainless-Steel Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.

1. Frames for Highly Corrosive Applications: Fabricate frames with internal components, including anchors, plaster guards, and hardware reinforcements, from Type 316 stainless-steel sheet.
2. Mullions Rails and Transom Bars: Provide closed tubular members with no visible face seams or joints. Fasten members at crossings and to jambs by butt welding according to joint designs in HMMA 820.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

7. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - (1) Two anchors per jamb up to 60 inches in height
    - (2) Three anchors per jamb from 60 to 90 inches in height
    - (3) Four anchors per jamb from 90 to 96 inches in height
    - (4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height
  - b. Compression Type: Not less than two anchors in each jamb.
  - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
8. Head Reinforcement: For frames more than 48 inches wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
9. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare stainless-steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08711 - Door Hardware.
  1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
  2. Locate door hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each lite is capable of being removed independently.
  - 3. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.07 STAINLESS-STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Remove tool and die marks and stretch lines or blend into finish.
  - 1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
    - a. Grain for Doors: Vertical (long dimension of door)
    - b. Grain for Frame Jambs: Vertical (long dimension of jamb)
    - c. Grain for Frame Heads: Horizontal (long dimension of head)
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish stainless-steel doors and frames after assembly.
- D. Directional Satin Finish: No. 4 finish
- E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stainless-steel doors and frames.
  - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of stainless-steel door-frame connections before frame installation.

2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
  1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

### 3.03 INSTALLATION

- A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Stainless-Steel Frames: Install stainless-steel frames for doors and other openings, of size and profile indicated.
  1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint

- continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
- c. Install frames with removable glazing stops located on secure side of opening.
  - d. Install door silencers in frames before grouting.
  - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - g. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors, if so indicated and approved on Shop Drawings.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry."
  4. Concrete Walls: Solidly fill space between frames and concrete with grout. Install grout in lifts and take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
  5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  6. Installation Tolerances: Adjust stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall

- d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor
- C. Stainless-Steel Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
  - 1. Non-Fire-Rated Doors
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with stainless-steel door and frame manufacturer's written instructions.
  - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

### 3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work including stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.
- C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

### 3.05 DOOR AND FRAME SCHEDULE

- A. Provide stainless steel doors and frames as specified herein and on Contract Documents.

-END OF SECTION-



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**Section 08311**  
**ACCESS DOORS AND FRAMES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
1. Wall access doors and frames
  2. Fire-rated wall and ceiling access doors and frames
  3. Floor doors and frames

**1.02 SUBMITTALS**

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- E. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
1. Method of attaching door frames to surrounding construction.
  2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

**1.03 QUALITY ASSURANCE**

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NYC Building Code and NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. UL 10B for vertical access doors
2. UL 263 for horizontal access doors and frames

- C. Size Variations: Obtain Commissioner's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

#### 1.04 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

A. Access Doors

1. Cendrex, Inc.
2. Karp Associates, Inc.
3. Nystrom Building Products Co.
4. Or approved equal

B. Floor Doors

1. Bilco Company (The)
2. Cendrex, Inc.
3. Karp Associates, Inc.
4. Milcor Limited Partnership
5. Nystrom Building Products Co.
6. Or approved equal

#### 2.02 MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.
- B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304
- C. Rolled-Stainless-Steel Floor Plate: ASTM A 793

#### 2.03 ACCESS DOORS AND FRAMES

- A. General Requirement for Access Doors and Frames: Subject to compliance with requirements provide stainless steel access doors and frames at all locations indicated on the drawings and at all locations where indicated on Plumbing, HVAC and Electrical Contract Drawings which would otherwise be inaccessible behind wall or ceiling construction.

B. Flush, Insulated, Fire-Rated Access Doors and Frames with Exposed Trim:  
Material to be stainless steel.

1. Location: At room 112
2. Fire-Resistance Rating: None
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
6. Hinges: Concealed pin type
7. Automatic Closer: Spring type
8. Latch: Self-latching bolt operated by key with interior release
9. Lock: Key-operated cylinder lock with interior release

C. Flush, Un-insulated, Fire-Rated Access Doors and Frames with Exposed Trim:  
Material to be stainless steel.

1. Locations: All other masonry walls as indicated in the drawings.
2. Fire-Resistance Rating: One and one-half hours
3. Door: Minimum 0.060-inch- thick sheet metal, flush construction.
4. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
5. Hinges: Concealed pin type
6. Automatic Closer: Spring type
7. Latch: Self-latching bolt operated by flush key with interior release.
8. Lock: Key-operated cylinder lock with interior release.

2.04 FLOOR DOORS

- A. Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release

handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.

- B. Stainless Steel Floor Door: Stainless-steel angle frame with 3/16- or 1/4-inch-thick, diamond-pattern, stainless-steel tread plate door; non-watertight; loading capacity to support 300-lbf/sq. ft. pedestrian live load.
- C. Options: Include the following options:
  - 1. Hinges: Heavy-duty, stainless steel butt hinges with stainless-steel pins.
  - 2. Latch: Stainless steel slam latch.
  - 3. Lock: Stainless-steel snap lock with removable outside handle.
  - 4. Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.
  - 5. Safety Accessories: Safety chains.

## 2.05 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Stainless Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
  - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
  - 2. Provide mounting holes in frames to attach frames to metal, or concrete construction. Furnish adjustable metal masonry anchors.
- C. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For cylinder lock, furnish two keys per lock and key all locks alike.

## 2.06 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 EXECUTION

3.01 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames and floor doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

3.03 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

- END OF SECTION -

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**Section 08331**  
**OVERHEAD COILING DOORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following types of electric-motor-operated overhead coiling doors:
  - 1. Stainless Steel Insulated overhead coiling doors.
  - 2. Stainless Steel Fire-rated counter shutters.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01821 - Equipments Start Up and Training
- B. Section 08711 - Door Hardware
- C. Division 16 for electrical service and connections for powered operators and accessories.
- D. Division 17 for SCADA System requirements.

**1.03 DEFINITIONS**

- A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Operation-Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 100 cycles a day.
  - 1. Include tamperproof cycle counter.

**1.05 SUBMITTALS**

- A. Product Data: For each type and size of overhead coiling door, fire-rated shutter and accessory. Include the following:
  - 1. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.



- C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.

1. Curtain Slats: 12 inches long
2. Bottom Bar: 6 inches long
3. Guides: 6 inches long
4. Brackets: 6 inches square
5. Hood: 6 inches square

- D. Qualification Data: For Installer.

## 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer. Obtain operators and controls from overhead coiling door manufacturer.
- C. Fire-Test-Response Characteristics: Provide assemblies complying with NFPA 80 that are identical to door and frame assemblies tested for fire-test-response characteristics per UL 10B and, and that are listed and labeled for fire ratings indicated by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cookson Company.
  2. Cornell Iron Works Inc.
  3. McKeon Rolling Steel Door Company, Inc.
  4. Or approved equal

### 2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Insulated Overhead Coiling Doors: Type 304 ASTM A 666, not less than 24 gauge interlocking double stainless steel flat slats, cold roll formed. Fill slat with manufacturer's standard rigid cellular polyurethane-foam-type thermal insulation with R-value of not less than 5.0 and complying with maximum flame-spread and

smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.

- B. Endlocks for Overhead Coiling Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement. Bottom Bar for Overhead coiling doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; stainless-steel to suit type of curtain slats.
- C. Curtain Jamb Guides for Overhead Coiling Doors: Fabricate curtain jamb guides of Type 304 stainless steel with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- thick steel sections complying with ASTM A666. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent over travel of curtain. Provide UL approved smoked seals on each guide assembly.

## 2.03 HOODS AND ACCESSORIES

- A. Hood: Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
  - 1. Fabricate hoods for stainless-steel doors of minimum 0.025-inch thick stainless-steel sheet, Type 316, complying with ASTM A 666.
  - 2. Shape: round.
- B. Smoke Seals: Provide fire shutters with UL-listed and tested smoke-seal perimeter gaskets.
- C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
  - 1. Lock cylinder is specified in Section 08711 - Door Hardware.
  - 2. If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.
- D. Provide automatic-closing device that is inoperative during normal door operations, with governor unit complying with requirements of NFPA 80 and with an easily tested and reset release mechanism, and designed to be activated by the following:
  - 1. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.

2. Door-holder-release devices connected with building fire alarm and detection system.

#### 2.04 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
- D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

#### 2.05 ELECTRIC DOOR OPERATORS

- A. Overhead Coiling Doors: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation. Equip operator with an adjustable screw-type limit switch to break a circuit at termination of travel.
  1. Motor: Provide continuous duty, thermally protected, ball bearing with a class F insulation. Single-phase motors are to be capacitor start, polyphase are to be squirrel cage induction.
  2. Starter: Provide magnetic reversing starter, size "0", across the line type with mechanical and electrical interlocks, 10 amp rating and 24 volts control circuit.
  3. Brake: Intermediate duty, rectifier activated, integral, within the operator's housing.

4. Control Station: Furnish all operators with one three bottom control station marked open, close, and stop, housed in NEMA 4X enclosure. Mount on inside and outside of door.
  5. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
  6. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
  7. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24V, ac or dc.
- B. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety device capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
1. Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

## 2.06 FIRE RATED COUNTER SHUTTERS

- A. Curtain: Shall be assembled of interlocking stainless steel slats, cold rolled. Slats shall have end locks locking each end of alternate slats to act as a wearing surface, and maintain slat alignment. Curtain shall be 22 gauge minimum (.029 thick) or gauge required by Underwriters Laboratories and Factory Mutual.
1. Slats: Shall be of a cross section not less than 1 1/4" wide by 1/2" deep.
- B. Bottom Bar: Shall consist of one (1) angle not less than 1 1/2" x 1 1/2" x 1/8" stainless steel formed to fit slats. Bottom bar shall be provided with slotted holes to allow for thermal expansion.
- C. Guides: Each stainless steel guide assembly shall be fabricated of a minimum of 1/8" angles and channels in a box type configuration. Guides shall be provided with slotted holes to allow for thermal expansion. Provide UL approved smoke seals on each guide assembly conforming to UL1784. Provide units with an "S" Label.
- D. Brackets: Mounting brackets of hot rolled 1/4" steel plate, shall be provided to house ends of the counterbalance assembly.
- E. Hood: Shall be provided to entirely enclose curtain and counterbalance assemblies. The stainless steel hood shall be of a design to match brackets. Tops and bottoms shall be bent and reinforced for stiffness. Provide intermediate support brackets at all seams to prevent sagging. Provide UL approved lintel smoke seals.

- F. Hand Crank Operator: Hand Crank operated door shall be provided with a compact power unit designed and built by the door manufacturer. Operators shall be equipped with high efficiency planetary gearing running in an oil bath, and shall be furnished together with a centrifugal governor, spring-set brake and a fail-safe magnetic release device, completely housed to protect against damage, dust, and moisture.
- G. Self-Closing Mechanism: The fire door is to be designed with a centrifugal governor as an integral part of the operator's construction. The automatic release mechanism shall be triggered by a fusible link, smoke detector or fire alarm. When triggered the door is released and begins to close due to gravitational force. The speed of the door is governed by a centrifugal governor, designed to match the normal operating speed of the door, at a rate of not greater than 9" per second or less than 6" per second.
- H. Magnetic Release with 10 Second Time Delay: A fail-safe magnetic release device shall be built into the operator as an integral part of the release mechanism. When power is interrupted to the release mechanism by the smoke detector or fire alarm, the door shall begin to self-close. In the event of power failure the time delay shall prevent the fire door from closing for a period of 10 seconds. Once the 10 seconds have lapsed, the fire door shall self close. Once power has been restored the automatic reset time delay as well as the fire door shall reset themselves, and the door shall automatically power it-self back to the fully open position.
- I. Finishing: All stainless steel shall be finished to a #4 grade.

## 2.07 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.08 STAINLESS-STEEL FINISHES

- A. General: Remove or blend stretch lines and tool and die marks into finish.
  - 1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Bright, Directional Polish: No. 4 finish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 EXECUTION

## 3.01 INSTALLATION

- A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

- 1. Install fire-rated doors to comply with NFPA 80.

## 3.02 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and fit around entire perimeter.

## 3.03 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.

- 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - a. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

## 3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City's maintenance personnel to adjust, operate, and maintain overhead coiling doors. Refer to Section 01821 - Training.

-END OF SECTION-

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**Section 08342**  
**OVERHEAD HIGH SPEED FABRIC DOORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following types of overhead high speed coiling doors:
  - 1. High speed, overhead fabric coiling service door assemblies, as indicated.
  - 2. Motors, operators, control devices, actuator systems, guides/tracks, hoods closures and other accessories.

**1.02 RELATED SPECIFICATIONS**

- A. Section 08110 – Stainless Steel Doors and Frames
- B. Section 14511 – Container Transport System
- C. Section 17600 – SCADA System – Control Strategies
- D. Sections related to Electrical Power Signal and Control Work

**1.03 DEFINITIONS**

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide overhead high speed fabric door assemblies capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
  - 1. Wind Load: Uniform pressure (velocity pressure) of 40 lbf/sq. ft., acting inward and outward.
- B. Operation-Cycle Requirements: Design overhead high speed door components and operator to operate for 5 years minimum, but not less than 750,000 cycles and for 400 cycles per day.
  - 1. Include tamperproof cycle counter.

**1.05 SUBMITTALS**

- A. Product Data: For each type and size of overhead high speed fabric door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:



1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
  2. Summary of forces and loads on walls and jambs.
  3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
  2. Include design drawings fully detailing each door assembly; indicate size, clearances, and load diagrams; construction details for jamb, head, and sill; material types, sizes, shapes, thicknesses, joints and connections; hardware, safety devices, and mechanical device descriptions including motor sizes in HP, voltage, phase, and hertz; location of control panels and drive units; and all design and detail data for work of other trades affected by the installation of the overhead fabric doors.
- C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- 1.06 QUALITY ASSURANCE
- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead high speed fabric door manufacturer for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead high speed fabric coiling doors through one source from a single manufacturer.
1. Obtain operators and controls from the overhead fabric door manufacturer.
- C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

## 1.07 DELIVER, STORAGE AND HANDLING

- A. Delivery of materials shall be in original rolls, packages, boxes, or crates bearing the manufacturers name, brand, model number, and installation location. Store all materials in dry locations with adequate ventilation, free from dust and water, and available for inspection and handling. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to the acceptance of the Commissioner, and replace with new items.

## 1.08 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer and installer agree to repair or replace overhead high speed fabric door assemblies that fail in materials or workmanship within specified warranty periods.

- 1. Warranty Period: Provide the following:

- a. Door Type 1: Balance springs, mechanical, and electrical components for two years from date of Substantial Completion; and door fabric for the life of the installation.
  - b. Door Type 2: Balance/tension springs and door fabric for five years from date of Substantial Completion.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide overhead high speed fabric door assemblies as manufactured by the following:

- 1. Albany International Corporation
  - 2. Rytec Corporation
  - 3. Or approved equal

- B. Selected Products: Provide the following:

- 1. High Speed Coiling Fabric Door Assemblies (Type 1): Subject to compliance with requirements, provide counterbalanced, high speed coiling fabric door assemblies "M&I Re-Coil-Away" as manufactured by Albany International Corp.
  - 2. High Speed Coiling Fabric Door Assemblies (Type 2): Subject to compliance with requirements, provide counterbalanced high speed coiling fabric door assemblies "Rapid Roll Model 670" as manufactured by Albany International Corp., or "Fast Seal" as manufactured by Rytec Corp.

## 2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Fabric/Curtain: Fabricate overhead high speed fabric door curtains of flame-resistant material with reinforcing, designed to withstand wind loading indicated, in a continuous length for width of each door opening (without splices). Unless otherwise indicated, provide curtain of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Door Type 1: Provide the manufacturer's heavy-duty, woven polyester reinforced, styrene butadiene rubber fabric (70 durometer); not less than 1/4 inch thick. Reinforced rubber fabric shall be provided with the manufacturer's standard bonded continuous beveled "Windlok" assemblies. Fabric shall be UV stable, self-extinguishing, and suitable to withstand temperatures between +180 to -40 degrees F. without limiting door operation.
    - a. Color: As selected by the Commissioner from the manufacturer's standard colors to match Commissioner's sample – Pantone "Blue No. 301U."
  2. Door Type 2: Provide the manufacturer's heavy-duty, woven polyester reinforced, PVC impregnated and coated fabric; not less than 0.08" thick. Fabric shall be UV stable, self-extinguishing, and suitable to withstand temperatures between +212 to -31 degrees F. without limiting door operation.
    - a. Color: As selected by the Commissioner from the manufacturer's standard colors to match Commissioner's sample – Pantone "Blue No. 301U".
  3. Windows (Type 1/Type 2): Provide manufacturer's standard transparent vinyl fabric windows integrated with fabric panels. Provide windows as shown on drawings.
- B. Door Headers and Balance Mechanisms
1. Headers: Provide the following header assemblies:
    - a. Type 1: Provide 8-5/8" diameter high strength steel tubes, with a minimum 0.188 inch wall thickness; complying with ASTM A 513. Drum tube deflection shall be limited 0.03" per foot. Provide 2" diameter bolt-on steel, drive barrel shafts complying with ASTM C1045.
      - (1) Idler: Provide 4" diameter (outside) round tubing guiding barrel with a minimum wall thickness of 0.134 inches. Provide 1-1/2" diameter steel support shafts complying with ASTM C 1018.

- (2) Top Plates: Manufacturer's standard 1/4" thick hot rolled steel plates fitted with heavy duty, self-aligning bearings and cast iron housings. Two inch shaft bearings shall be rated at 10,800 lbs dynamic and 6,400 lbs static; 1-1/2 inch idler bearings shall be load-rated at 8,150 lbs dynamic and 4,400 lbs. static. Provide manufacturer's top roll alignment plates.
    - (3) Truss: Provide manufacturer's recommended, fully welded, steel truss/spreader bar assemblies fabricated from 2-1/2" x 2-1/2" x 1/4" (minimum) steel angles with diagonal braces. Size assemblies to support loads of up to 2,000 lbs.
  - b. Type 2: Provide 5-1/2" diameter high strength steel tubes, 11 gage minimum wall thickness; complying with ASTM A 513. Drum tube deflection shall be limited 0.01" per foot; and shall not exceed 0.14" over the entire length.
- 2. Counterbalance Assemblies: Provide the following:
  - a. Type 1: Provide the manufacturer's standard pre-mounted counterbalance system with evenly balanced 200,000 cycle oil tempered helical outboard torsion springs with protective hood.
  - b. Type 2: Provide the manufacturer's standard internally mounted counterbalance system utilizing an extension spring along with factory lubricated 6 x 3/16" steel cables, and Alloy 319 die cast cable drums, and high impact injection molded plastic pulley mechanism with a pair of permanently sealed lubricated ball bearings; with evenly balanced 200,000 cycle torsion springs with protective hood.
- C. Endlocks: Malleable-iron castings galvanized after fabrication, secured to fabric curtain with stainless steel rivets, galvanized rivets, or high-strength nylon. Provide locks on fabric curtain for curtain alignment and resistance against lateral movement in accordance with the approved Shop Drawings.
- D. Bottom Bar: Provide the following:
  - 1. Type 1: Consisting of a 2-1/2" x 2-1/2" x 1/4" steel angle and a 3" x 0.188" flat bar; mechanically fastened together. Bottom bar shall have a "break bols, each not less than 2-1/2 by 2-1/2 by 1/4 inch thick and 3 x 0.188 inch flat bar bolted together. Assembly shall be fabricated with the manufacturer's recommended "break-away" center section construction.
    - a. Provide a 6-inch replaceable, self-adjusting, continuous, compressible gasket of flexible EPDM weatherproofing loop.
    - b. Provide fail-safe type, automatic, electric, revering mechanism located in door assemblies bottom edge.

2. Type 2: Consisting of the manufacturer's standard, 4-1/2" high, extruded aluminum, alloy 6063 removable bottom beam /bar.
    - a. Provide the manufacturer's "contact-less" through-beam photocells and retractable steel end guides. Locate photocell position sensor at a height of 6 inches below bottom of door edge. Include replaceable, self-adjusting, continuous, compressible flexible EPDM gasket door bottom with additional pneumatically operated pressure switch.
    - b. Provide fail-safe type, automatic, electric, reversing mechanism located in door assemblies bottom edge.
- E. Fabric Jamb Guides: Fabricate fabric jamb guides as follows:
1. Type 1: Provide the manufacturer's standard heavy-duty, breakaway style "Windlok" and guide system. System shall be fabricated from 8-1/2" x 5" heavy-duty hot-dip galvanized steel side frames; fabricated and arranged to meet the specified performance criteria; and allow the fabric to operate smoothly.
    - a. Build up units with not less than the sizes recommended by the manufacturer, and fabricated of galvanized steel sections complying with ASTM A 36, and ASTM A 123. Provide for guide adjustment. Provide removable stops on guides to prevent overtravel of fabric curtain and a continuous bar for holding windlock assemblies.
    - b. Finish: Manufacturer's standard chemical/corrosion resistant finish system; color as selected by the Commissioner from manufacturer's standard colors.
  2. Type 2: Provide the manufacturer's standard heavy-duty, 14 gage galvanized sections including covers with 12 gage galvanized structural C-channel to guide door panel during operation.
    - a. Provide the manufacturer's standard "brush" seals.
    - b. Finish: Manufacturer's standard chemical/corrosion resistant finish system; color as selected by the Commissioner from manufacturer's standard colors.
  3. Provide covers at jamb mechanisms with either swinging or lift-off service panels as required by adjacent curbs, rails, or other obstructions.
- F. Wind Bars (Type 1 and Type 2): Provide manufacturer's standard retracting internal and external wind bar stiffener battens to resist wind loads indicated.

## 2.03 DOOR CONTROLS

- A. General: Provide the high-speed roll-up door controls as specified herein, as scheduled in Section 08110, and as indicated on the Drawings. Coordinate the installation, and interface, of these controls with Section 17600 – SCADA System – Control Strategies.
- B. Controls “Category A”
  - 1. Provide a vendor-supplied controller, mounted as shown, which will control the door. The controller shall include all opening and closing logic, including all safety-related logic. The controller shall include the following front-panel mounted items:
    - a. Manual-auto selector switch
    - b. Open and close push buttons
  - 2. Manual Mode Operation: The door shall be opened and closed by the operator in either of two following locations:
    - a. The open and close push buttons on the vendor-supplied controller
    - b. Open and close push buttons on the outboard lidding station
  - 3. Automatic Mode Operation: The door shall be opened and closed automatically from signals from the container transport system via the outboard lidding control panel. The system shall open the door immediately prior to moving a shuttle car into or out of the building, and shall close the door immediately after the shuttle car passes through the door. Signals from the vendor-supplied controller to the container transport system (via the outboard lidding station) shall be dry contact closures, rated at 5 amps at 120 VAC, and shall be as follows:
    - a. Door in auto mode
    - b. Door fully open
    - c. Door fully closed
    - d. Door failure
  - 4. The vendor-supplied controller shall accept dry contact closures, rated at 5 amps at 120 VAC, from the outboard lidding station as follows:
    - a. Open door
    - b. Close door
  - 5. The vendor-supplied controller shall also provide a dry contact closure, rated at 5 amps at 120 VAC, for connection to the access control security system. The signal shall be as follows:
    - a. Door fully closed

6. Applications: Provide "Category A" controls for doors OHD-05 through OHD-08.

C. Controls "Category B"

1. Provide a vendor-supplied controller, mounted as shown, which will control the door. The controller shall include all opening and closing logic, including all safety-related logic. The controller shall include Open and Close push buttons on the front of the panel.
2. Door information shall be sent to the SCADA system. Signals between the vendor-supplied controller and the SCADA system shall be dry contact closures, rated at 5 amps at 120 VAC, and shall be as follows:
  - a. Door fully open
  - b. Door fully closed
  - c. Door failure
3. The vendor-supplied controller shall also provide a dry contact closure, rated at 5 amps at 120 VAC, for connection to the access control security system. The signal shall be as follows:
  - a. Door fully closed
4. Applications: Provide "Category B" controls for door OHD-03.

D. Controls "Category C"

1. Provide a vendor-supplied controller, mounted as shown, which will control each door. The controller shall include all opening and closing logic, including all safety-related logic. The controller shall include "Open" and "Close" push buttons on the front of the panel. An additional push-button station, containing "Open" and "Close" push buttons, shall be provided and mounted as shown.
2. Applications: Provide "Category C" controls for door OHD-04 and OHD-20.

E. Controls "Category D"

1. Provide a vendor-supplied controller, mounted as shown, which will control the door. The controller shall include all opening and closing logic, including all safety-related logic. The controller shall include the following front-panel mounted items:
  - a. Manual-auto selector switch
  - b. Open and Close push buttons
2. Manual Mode Operation: The door shall be opened and closed by the Open and Close push buttons on the vendor-supplied controller.

3. Automatic Mode Operation: The door shall be opened and closed automatically, based on controls and sensors provided by the door supplier. A magnetometer-based vehicle detection system, installed to detect oncoming traffic, shall open the door. Photo-eyes, installed in the doorframes, shall close the door shortly after the vehicle passes through the door.
4. Door information shall be sent to the SCADA system. Signals between the vendor-supplied controller and the SCADA system shall be dry contact closures, rated at 5 amps at 120 VAC, and shall be as follows:
  - a. Door fully open
  - b. Door fully closed
  - c. Door failure
5. The vendor-supplied controller shall also provide a dry contact closure, rated at 5 amps at 120 VAC, for connection to the access control security system. The signal shall be as follows:
  - a. Door fully closed
6. Applications: Provide "Category D" controls for doors OHD-01 and OHD-02.

F. Controls "Category E"

1. Provide a vendor-supplied controller, mounted as shown, which will control the door. The controller shall include all opening and closing logic, including all safety-related logic. The controller shall include the following front-panel mounted items:
  - a. Manual-auto selector switch
  - b. Open and Close push buttons
2. Manual Mode Operation: The door shall be opened and closed by the Open and Close push buttons on the vendor-supplied controller.
3. Automatic Mode Operation: The door shall be opened and closed automatically, based on controls and sensors provided by the door supplier. Two magnetometer-based vehicle detection systems shall be installed to detect oncoming traffic on either side of the door. Either loop detector, sensing a vehicle, shall open the door. The opposing loop detector shall close the door after the vehicle passes through the door.
4. The vendor-supplied controller shall also provide a dry contact closure, rated at 5 amps at 120 VAC, for connection to the access control security system. The signal shall be as follows:
  - a. Door fully closed



5. Applications: Provide "Category E" controls for door OHD-10.

- G. Vehicle Detection: Vehicle detection shall be a magnetometer-based vehicle detection system as shown. System shall include sensor, wireless access point, and contact closure card as shown. Gate controller shall use the contact closure card input to determine absence of vehicle from shadow area. Detection system shall include all power supplies, interposing relays, enclosures and appurtenances to comprise a complete operating system.

## 2.04 HOODS AND ACCESSORIES

- A. Hood: Form to entirely enclose coiled fabric curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
1. Fabricate hoods of stainless-steel sheet, Type 316, complying with ASTM A 240 or ASTM A 666, and not less than 0.025-inch thick
  2. Shape: As indicated.
- B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weatherstripping gaskets fitted to exterior doors, unless otherwise indicated. Employ the manufacturer's replaceable, continuous type secured to inside of fabric coil hood.
1. Provide motor-operated doors with combination bottom weatherseal and sensor edge, unless otherwise indicated.
  2. Door jambs shall be replaceable, adjustable, continuous, flexible seals of flexible vinyl, rubber, or neoprene for a weathertight installation.
- C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
1. Lock cylinder is specified in Section 08711 - Door Hardware.
- D. Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

## 2.05 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance

of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.06 STAINLESS-STEEL FINISHES

- A. General: Remove or blend tool and die marks and stretch lines into finish.
- B. Bright, Cold-Rolled, Unpolished Finish: No. 2B finish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 2.07 FERROUS METAL FINISHES

- A. General: Manufacturer's standard primer, compatible with shop -applied finish according to manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
  - 1. Apply to ferrous surfaces except zinc-coated metal.
- B. Finish: Manufacturer's standard chemical and corrosion resistant, high performance finish consisting of chemical wash type primer and topcoats according to coating manufacturer's written instructions for cleaning, pretreatment, application, curing, and minimum dry film thickness.
  - 1. Color and Gloss: A selected by Commissioner from manufacturer's full range.

## 2.08 ELECTRIC DOOR OPERATORS

- A. General: Provide heavy-duty electric door operator assemblies of size and capacity recommended and provided by door manufacturer for door and operational life specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Type 1: Drive unit shall be an electrically operated, heavy-duty assembly featuring a self-inhibiting worm gear. The motor and gearbox shall be designed for high cycle operation. Door position shall be controlled by top and bottom limit switch. Basic operation features a manual disengagement lever to place door in manual operation mode. A safety disengagement switch shall be included with the disengagement mechanism. Drive assembly shall include a back-up safety top and bottom limits.
  - 2. Type 2: Drive unit shall be an electrically operated, heavy-duty assembly featuring the manufacturer's standard Hypoid gear. The motor and gearbox shall be designed for high cycle operation. Door position shall be controlled by a bi-directional pulse encoder or limit switches.. Basic operation features

shall include inverter for soft starting and stopping, automatic closing timer, emergency stop, one actuating push button, and inline photocell and a brake release lever with a safety switch for manual operation.

- B. Comply with NFPA 70.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA 4, with NFPA 70 Class 2 control circuit, maximum 110 VAC.
- F. Door-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft, gear-head hoist-type door operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, chain and sprocket secondary drive, and auxiliary chain-hoist and floor level disconnect.
- G. Electric Motors: Provide the following:
  - 1. Type 1: Provide high-starting torque, reversible, continuous-duty, Class A insulated, 5 HP, two-speed electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than the following speeds; without exceeding nameplate ratings or considering service factor.
    - a. Speed: 3' per second, unless otherwise acceptable to the Commissioner.
    - b. Type: 3 Phase, 60Hz, 20 amps; voltage as recommended by the manufacturer.
    - c. Service Factor: According to NEMA MG 1, unless otherwise indicated.
    - d. Coordinate wiring requirements and electric characteristics of motors with building electrical system.
    - e. Provide totally enclosed, non-ventilated or fan-cooled motors, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated.
  - 2. Type 2: Provide high-starting torque, reversible, continuous-duty, Class A insulated, 1.5 HP, two-speed electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either

direction, from any position, at not less than the following speeds; without exceeding nameplate ratings or considering service factor.

- a. Speed: 100" per second, unless otherwise acceptable to the Commissioner.
  - b. Type: 3 Phase, 60 Hz, 15 amps; voltage as recommended by the manufacturer.
  - c. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  - d. Coordinate wiring requirements and electric characteristics of motors with building electrical system.
  - e. Provide open drip-proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
  - f. Provide totally enclosed, non-ventilated or fan-cooled motors, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated
- H. Remote-Control Station: Provide momentary-contact, 2-button control station with push-button controls labeled "Open," and "Close."
1. Provide exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- J. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.
- K. Control Panels: Provide the manufacturer's standard drive controller assemblies. Assemblies shall be a fully programmable logic type controller or ACS 50 controller as acceptable to the Commissioner. Control panels shall be pre-wired to the greatest extent possible, and be ULC listed. Control panel shall accommodate soft/start soft/start ability. Control panel shall allow for top and bottom limit adjustment via the control panel, unless otherwise acceptable to the Commissioner. Control panel shall include an adjustable, automatic closing timer, emergency stop, one actuating push button and cycle counter.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install doors and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to approved Shop Drawings, manufacturer's written instructions, and as specified.

3.02 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

3.03 DEMONSTRATION/ TRAINING

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train City of New York's maintenance personnel as specified below:
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 2. Train City of New York's designated personnel on procedures and schedules related to startup and shutdown, trouble-shooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
  - 3. Review data in the maintenance manuals. Refer to Section 01781 - Project Closeout and Section 01831 – Operation and Maintenance Manuals.
  - 4. Schedule training with the City of New York with at least 7 days' advance notice.

-END OF SECTION-

**Section 08520**  
**ALUMINUM WINDOWS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following types of aluminum-framed windows:
  - 1. Interior and exterior fixed windows, as indicated.
  - 2. Exterior projected windows, as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 – Plant-Precast Architectural Concrete
- B. Section 04201 - Unit Masonry
- C. Section 07410 - Metal Wall Panels
- D. Section 07620 - Sheet Metal Flashing and Trim
- E. Section 07920 - Exterior Joint Sealants
- F. Section 08660 - Window Security Screens
- G. Section 08800 - Glazing

**1.03 DEFINITIONS**

- A. HC: Heavy Commercial
- B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.
- C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.
- D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

**1.04 PERFORMANCE REQUIREMENTS**

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
  - 1. Minimum size required by gateway performance requirements for determining compliance with AAMA/NWWDA 101/I.S.2 for both gateway performance requirements and optional performance grades.

- B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2.
  - 1. Performance Class/Grade: AP-AW50
- C. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- D. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
  - 1. U-Value: 0.57 Btu/sq. ft. x h x deg F. (maximum)
- E. Solar Heat-Gain Coefficient: Provide aluminum windows with a whole-window SHGC maximum of 0.77, determined according to NFRC 200 procedures.
- F. Sound Transmission Class: Provide glazed windows rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- G. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces

#### 1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:
  - 1. Joinery details
  - 2. Flashing and drainage details
  - 3. Weather-stripping details
  - 4. Thermal-break details

5. Glazing details
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:
  - C. Samples for Initial Selection: For units with factory-applied color finishes.
  - D. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below.
    1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.
    2. Hardware: Full-size units with factory-applied finish.
    3. Weather Stripping: 12-inch- long sections.
    4. Commissioner reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.
  - E. Qualification Data: For Installer.
  - F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.
  - G. Maintenance Data: For operating hardware, weatherstripping and finishes to include in maintenance manuals.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- B. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.



- D. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Provide AAMA-certified aluminum windows with an attached label.

- E. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

- F. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup in building envelope wall in locations shown on Drawings.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

#### 1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.

2. Structural failures including excessive deflection.

3. Water leakage, air infiltration, or condensation.

4. Faulty operation of movable sash and hardware.

5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  6. Insulating glass failure.
- B. Warranty Period: Three years from date of Substantial Completion.
- C. Warranty Period for Metal Finishes: 15 years from date of Substantial Completion.
- D. Warranty Period for Glass: 10 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EFCO Corporation
  2. Kawneer Company, Inc.
  3. TRACO
  4. Or approved equal
- B. Selected Product: Subject to compliance with requirements, provide heavy commercial (Architectural Grade) aluminum projected window assemblies "Series 3902 Thermal" as manufactured EFCO, or approved equal acceptable to the Commissioner.

### 2.02 MATERIALS, GENERAL

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.
- B. Fasteners: Nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
  2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners of nonmagnetic stainless steel with exposed surfaces finished to match members or hardware being fastened, as appropriate.

- C. Anchors, Clips, and Accessories: Nonmagnetic stainless steel complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.
  - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.
- F. Replaceable Weather Seals: Comply with AAMA 701/702.
- G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

## 2.03 GLAZING

- A. Glass and Glazing Materials: Refer to Section 08800 - Glazing for glass units and glazing requirements applicable to glazed aluminum window units.

## 2.04 HARDWARE

- A. General: Provide manufacturer's premium/custom hardware fabricated from nonmagnetic stainless steel, complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide nonmagnetic stainless steel.
- B. Four-Bar Friction Hinges: Comply with AAMA 904.1.
  - 1. Locking mechanism and handles (standard cam- and pole ring cam-types) for manual operation.
  - 2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, non-staining, non-corrosive, durable material.
- C. Limit Devices: Provide limit devices designed to restrict sash or ventilator opening.
  - 1. Safety Devices: Limit clear opening to 6 inches for ventilation.

- D. Projected and Inswing Windows: Provide the following operating hardware:
1. Hinge: Concealed four- bar friction hinge with adjustable-slide friction shoe; two per ventilator.
  2. Lock: Manual or pole-operated cam-type lock and keeper assemblies.
  3. Limit Device: Concealed support arms with adjustable, limited, hold-open limit device; located on jamb of each ventilator.
  4. Pole Operators: Provide the window manufacturers standard tubular-shaped anodized aluminum pole operators; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate bottom hinged inswing aluminum windows; 1 pole operator and pole hanger per room that has bottom hinged inswing windows.

## 2.05 FABRICATION

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWDA 101/I.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
  2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
  3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- F. Provide watershed members above side-hinged ventilators and similar lines of natural water penetration.

- G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- H. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.
- I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Section 08800 - Glazing and with AAMA/NWWDA 101/I.S.2.
- J. Glazing Stops: Provide snap-on glazing stops coordinated with Section 08800 - Glazing and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

## 2.06 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
    - a. Color: Custom color matching Pantone Matching System (PMS) Color – Color Gray No 2U.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough

opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Metal Protection: Separate aluminum and other corrodible surfaces from concrete, masonry, and other sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

### 3.03 ADJUSTING

- A. Adjust operating sashes and ventilators, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

### 3.04 PROTECTION AND CLEANING

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

- END OF SECTION -

**Section 08630**  
**TRANSLUCENT INSULATING PANELS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes assemblies incorporating fiberglass sandwich panels and aluminum frame systems as follows:

1. Clerestory wall assemblies, as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 05120 - Structural Steel
- C. Section 07210 - Building Insulation
- D. Section 07410 - Metal Wall Panels
- E. Section 07620 - Sheet Metal Flashing and Trim
- F. Section 07920 - Exterior Joint Sealants
- G. Section 10436 - Exterior Signs

**1.03 PERFORMANCE REQUIREMENTS**

- A. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads
2. Thermal movements
3. Movements of supporting structure
4. Dimensional tolerances of building frame and other adjacent construction

- B. Failure includes the following:

1. Deflection exceeding specified limits
2. Water leakage
3. Thermal stresses transferred to building structure
4. Noise or vibration created by wind and thermal and structural movements
5. Loosening or weakening of fasteners, attachments, and other components
6. Delamination of fiberglass-sandwich-panel faces from panel cores
7. Deterioration of fiberglass facing materials

- C. Structural Loads

1. Wind Loads: 40 lbs/sf acting inward or outward (minimum), unless otherwise required by the current New York City Building Code.
2. Seismic Loads: As indicated by earthquake design data on Drawings.



3. Load Combinations: Calculate according to requirements of applicable code indicated on Drawings.

D. Deflection of Assemblies

1. Vertical Assemblies: Limited to  $L/360$  of clear span for each assembly component.
2. Horizontal Assemblies: Limited to  $L/360$  of clear span for each assembly component.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.04 PERFORMANCE TESTING

A. Provide assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.

B. Structural-Performance Test: ASTM E 330.

1. Performance at Design Load: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. Performance at Maximum Test Load: When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main supporting members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

C. Air-Infiltration Test: ASTM E 283.

1. Minimum Static-Air-Pressure Difference: 6.24 lbf/sq. ft.
2. Maximum Air Leakage: 0.06 cfm/sq. ft.

D. Test for Water Penetration under Static Pressure: ASTM E 331.

1. Minimum Static-Air-Pressure Difference: 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
2. Water Leakage: None.

E. Test for Water Penetration under Dynamic Pressure: AAMA 501.1.

1. Dynamic Pressure: 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..
2. Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.
- B. Shop Drawings: For assemblies. Include plans, elevations, sections, details, and attachments to other work.
  1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each frame system intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  1. Joinery
  2. Anchorage
  3. Expansion provisions
  4. Fiberglass sandwich panels
  5. Flashing and drainage
  6. Curved components
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- G. Maintenance Data: For assemblies to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Entity capable of assuming engineering responsibility, including preparation of Shop Drawings, and performing work of this Section and who is acceptable to manufacturer.

- B. **Manufacturer Qualifications:** For fiberglass sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICBO ES AC04, "Sandwich Panels."
- C. **Product Options:** Information on Drawings and in Specifications establishes requirements for assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
  - 1. Do not modify intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If modifications are proposed, submit comprehensive explanatory data to Commissioner for review.
  - 2. The translucent insulated panel system provided shall not be used to support other building components, finishes, or systems other than itself.
- D. **Fire-Test-Response Characteristics:** Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- E. **Welding:** Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- F. **NFRC Certification:** Provide fiberglass sandwich panels that are certified for U-factors indicated according to NFRC 100 and listed in its "National Fenestration Council Incorporated - Certified Products Directory."
- G. **Mockups:** Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical corner assembly area as shown on Drawings.
  - 2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
  - 3. Protect approved mock-ups from weather and other elements which could cause damage.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. **Preinstallation Conference:** Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Package, wrap, crate and otherwise protect translucent insulated panel systems/components to ensure assemblies are delivered, stored and handled until time of installation without damages. Clearly mark cartons, crates and other wrappings identifying contents. Do not use permanent markings on exposed portions of the translucent insulated panel systems
  - 1. Protect system components from the elements.
  - 2. Immediately remove and re-wrap assemblies which have become wet.
  - 3. Remove protective wrappings/films after installation is complete (unless otherwise recommended by the manufacturer) to prevent fading and other such defects resulting from differential UV exposure.

**1.08 PROJECT CONDITIONS**

- A. Field Measurements: Indicate measurements on Shop Drawings.

**1.09 WARRANTY**

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering
    - c. Water leakage
  - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.
  - 1. Defects include, but are not limited to, the following:
    - a. Fiberbloom
    - b. Delamination of coating, if any, from exterior face sheet

- c. Discoloration of exterior face sheet of more than 8.0 units Delta E when measured according ASTM D 2244
  - d. Delamination of panel face sheets from panel cores
- 2. Warranty Period: 10 years from date of Substantial Completion
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
  - 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
  - 2. Warranty Period: 20 years from date of Substantial Completion

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Kalwall Corporation
  - 2. Major Industries, Inc.
  - 3. Skywall Translucent Systems; Vistawall Group (The)
  - 4. Structures Unlimited, Inc.
  - 5. Or approved equal

### 2.02 ALUMINUM FRAME SYSTEMS

- A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429
- B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
- C. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch thick.
- D. Frame-System Gaskets: Manufacturer's standard.
- E. Frame-System Sealants: As recommended in writing by manufacturer.

- F. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.
  - 1. At closures, retaining caps, or battens, use ASTM A 193/A 193M, 300 series stainless-steel screws.
  - 2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
  - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- G. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- H. Anchor Bolts: ASTM A 307, Grade A, hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- I. Frame System Fabrication
  - 1. Fabricate components before finishing.
  - 2. Fabricate components that, when assembled, have the following characteristics:
    - a. Profiles that are sharp, straight, and free of defects or deformations.
    - b. Accurately fitted joints with ends coped or mitered.
    - c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within the assembly to exterior.
  - 3. Fabricate sill closures with weep holes and for installation as continuous component.
  - 4. Reinforce components as required to receive fastener threads.
  - 5. Weld components in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

## 2.03 FIBERGLASS SANDWICH PANELS

- A. Panel Construction: Assembly of uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core and complying with requirements applicable to panel materials in ICBO ES AC04, "Sandwich Panels."
  - 1. Face-Sheet, Self-Ignition Temperature: 650 deg F or more per ASTM D 1929
  - 2. Face-Sheet Burning Extent: 1 inch or less per ASTM D 635
  - 3. Face-Sheet, Smoke-Developed Index: 450 or less per ASTM E 84
  - 4. Interior Face-Sheet, Flame-Spread Index: Not more than 25 per ASTM E 84
  - 5. Light Transmission: 50% minimum
- B. Panel Thickness: 2-3/4 inches
- C. Panel U-Factor: Not more than 0.53 measured in Btu/sq. ft. x h x deg F according to NFRC 100 or ASTM C 1363 using procedures described in ASTM C 1199 and ASTM E 1423.
- D. Panel Strength Characteristics
  - 1. Maximum Panel Deflection: 1.9 inches at 30 psf over a 10-foot span when tested according to ASTM E 72.
  - 2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf concentrated load when applied to a 3-inch- diameter disk according to ASTM E 661.
- E. Grid Core: Mechanically interlocked extruded-aluminum I-beams, with a minimum flange width of 7/16 inch.
  - 1. Extruded Aluminum: ASTM B 221, in alloy and temper recommended in writing by manufacturer
  - 2. I-Beam Construction: Thermally broken; two separate extruded-aluminum components permanently bonded by a material of low thermal conductance
  - 3. Grid Pattern: As indicated on Drawings
- F. Exterior Face Sheet
  - 1. Thickness: 0.070 inches
  - 2. Color: White, unless otherwise selected by the Commissioner.

3. Color Stability: Not more than 4.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering in southern Florida according to procedures in ASTM D 1435 with panels mounted facing south and as follows:
  - a. Panel Mounting Angle: Not more than 5 degrees from horizontal
  - b. Exposure Period: 60 months
4. Erosion Protection: Manufacturer's standard.
5. Impact Resistance: No fracture or tear at impact of 230 ft. x lbf by a 3-1/4-inch- diameter, 5-lb free-falling ball according to test procedure in UL 972.

G. Interior Face Sheet

1. Thickness: 0.060 inch
2. Color: White, unless otherwise selected by the Commissioner.

H. Fiberglass-Sandwich-Panel Adhesive: ASTM D 2559.

1. Compatible with facing and core materials.
2. Tensile and shear bond strength of aged adhesive ensures permanent adhesion of facings to cores, as evidenced by testing according to ASTM C 297 and ASTM D 1002 after accelerated aging procedures that comply with aging requirements for adhesives with high resistance to moisture in ICBO ES AC05, "Sandwich Panel Adhesives."

I. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
  - a. White spots indicating lack of bond at intersections of grid-core members are limited in number to 4 for every 40 sq. ft. of panel and limited in diameter to 3/64 inch.
2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.04 ACCESSORY MATERIALS

- A. Insulating Materials: Specified in Section 07210 - Building Insulation.



- B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.05 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: Match Commissioner's sample.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
  7. Seal joints watertight, unless otherwise indicated.
  8. Do not permit other building materials, systems or finishes from being supported by, or on the translucent insulated panel system (including, but not limited to panel system extrusions).
- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.
- F. Install insulation materials as specified in Section 07210 - Building Insulation.
- G. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:
1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
  2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.03 FIELD QUALITY CONTROL

- A. Testing Agency: City will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed assemblies with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
    - a. Test Procedures: Test under uniform and cyclic static air pressure
    - b. Static-Air-Pressure Difference: Not less than 27 lbf/sq. ft.
    - c. Water Penetration: None
  2. Water-Spray Test: Before installation of interior finishes has begun, assemblies shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 3.04 CLEANING AND REPAIR
- A. General: After translucent panel system installation clean both interior and exterior exposed surfaces of the panels, framing members and closures of dust, surface contaminants, and other such dirt in accordance with the system manufacturer's recommendations.
  - B. Remove protective wrapping/coverings, applied labels and other such markings from exposed surfaces.
  - C. Repair minor damages resulting from delivery, storage, handling and installation. Replace damaged components of the translucent insulated panel system, which cannot be repaired in the field, to the satisfaction of the Commissioner.

- END OF SECTION -

**Section 08660**  
**WINDOW SECURITY SCREENS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes fixed and operable security screen assemblies, as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 – Plant-Precast Architectural Concrete
- B. Section 07920 - Exterior Joint Sealants
- C. Section 08520 - Aluminum Windows

**1.03 REFERENCES**

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- 1. American Society for Testing and Materials (ASTM)
- 2. New York City Building Code

**1.04 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, descriptions, and finishes for each type of security screen and frame specified.
- B. Shop Drawings: In addition to requirements specified herein, provide a detailed location schedule of security screen assemblies using same reference numbers for details and openings as those on Drawings:
- 1. Elevations of each security screen
  - 2. Details of security screens
  - 3. Frame details for each frame type, including dimensioned profiles
  - 4. Details and locations of reinforcement and preparations for hardware
  - 5. Details of each different wall/substrate condition
  - 6. Details of anchorages, accessories, joints, and connections
  - 7. Section and connection details at 3/4" scale (minimum)

8. Indicate how release mechanisms are coordinated with operating sash on shop drawings

C. Samples for Verification: For each type of exposed finish required.

D. Construction Samples: 12-by-12-inch corner section representing the specified construction of security screens to be furnished by manufacturer.

1. Show welded corner joint, attachments and reinforcement.

E. Qualification Data: For Installer.

F. Warranties: Submit a sample of the actual manufacturer's warranty.

G. Keys: Provide two operating keys per window security screen assembly. Keys and locking mechanisms shall be keyed alike. Deliver keys to City and obtain receipt.

#### 1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum of three (3) years experience in successful manufacture of product of type and quality of that specified.

B. Installer: Minimum of three (3) years experience in installation of product of type specified.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver security screens wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Store assemblies under cover at Project site. Place units in a vertical position; spaced by blocking, on minimum 4-inch- high, wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

#### 1.07 PROJECT CONDITIONS

A. Field Measurements: Verify sizes and locations of each security screen by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.08 COORDINATION

- A. Coordinate installation of anchorages for security screens. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

## 1.09 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer and installer agrees to repair or replace security screen assemblies that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: One year from date of Substantial Completion.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide security screen assemblies as manufactured by the following:
  - 1. Exeter Architectural Products
  - 2. Harmony Products, Inc.
  - 3. Or approved equal
- B. Selected Products: Provide the following:
  - 1. "Crime-Shield" as manufactured by Exeter Architectural Products or approved equal
  - 2. "HP 1050A" as manufactured by Harmony Products, Inc. or approved equal

## 2.02 SECURITY SCREENS

- A. General: Provide fixed and operable, aluminum framed, perforated galvanized steel sheet type security screen assemblies. Assemblies shall receive a high performance synthetic powder coat finish system.
  - 1. Colors: Matching the Commissioner's sample.
- B. Security screen assembly construction as follows:
  - 1. General: Assemblies shall consist of an extruded aluminum frame; permanently affixed to fenestrations indicated on the Drawings; positioned in, and retained by frame. Individual screen panels shall be unitized and each three-dimensional assembly fabricated from a single sheet of steel formed into rigid unit.

2. Exterior Frames: Aluminum extrusions, alloy 6063-T6, minimum wall thickness 0.10". Joints mitered, fitted with corner keys, and welded (in an area concealed when installed).
3. Screen Panels: 12-gage cold-rolled steel, mill-galvanealed both sides. Provide "InvisiPerf No. 1" perforated panels with a minimum open area of 51% and visibility quotient of 2.60.

C. Fabrication

1. Screen Panels: Continuously protected by solid frame flanges running full height and width of each side of window opening; operate through a single-point exterior, keyed release mechanism for maximum security and safety.
  - a. Upon turning key the sliding planar motion shall first free barrier from frame retention members. Outward pivoting motion shall open panel.
2. Hinge and latch components, and fastening hardware, shall be fully concealed and inaccessible from exterior. Latch protected by a stainless steel enclosure, angled 45 degrees to deflect drill or other penetration attempts. A single locking pin shall be used, and shall not be visible through gaps in frame or between frame and barrier panel. Provide exterior key actuated latch device for hinged screens.
3. Frame retention members, together with hinge assembly and pivot shall be non-interdependent in design and construction so that compromised (or removed) hinged pins shall not make security screen panel operable from exterior. Panels shall be fully secured only by combined action of frame retention panels and latch pin.
4. Bottom frame member on side-pivoting units shall be equipped with UHMW (ultra-high molecular weight) plastic or other lifetime-lubricated bearing surface.
5. Frame equipped by manufacturer with adjustable mounting brackets to accommodate variations in window size and out-of-square conditions. Range of adjustability shall be minimum 3", vertically and horizontally.
6. Fasteners: Stainless steel, type determined by installer to best suit mounting to substrate. Mounting brackets shall be designed in such a way that fasteners employed to affix brackets to buildings shall always be within plane of exterior wall and hence stressed on forcible entry attempts in shear.
7. Barriers shall be for installation from exterior of building with common hand tools.
8. Frames shall be of type required for method of mounting (recessed and flush with plane of exterior wall) as detailed or indicated on Drawings.

## 2.03 FINISH

- A. Powder Coating: Coat with a colored polymeric urethane powder coating, minimum thickness of 3 mils. Coatings containing epoxy or lead are not acceptable.
  - 1. Substrate: Provide mechanical cleaning, chemical cleaning and then application of a corrosive inhibiting zinc coating before the final powder coat.
  - 2. Uniformly apply powder coating by the electrostatic method and then oven-cure at 400 degrees F to chemically bond the finish.
    - a. All fabrication including cutting, coping, grinding and welding shall be completed prior to application of corrosion inhibiting agent.
  - 3. Colors: Matching the Commissioner's samples.
- B. Coating Performance: The powder coating shall comply with ASTM standards as follows:
  - 1. Adhesion Cross Hatching Test                      ASTM D 3359B
  - 2. Flexibility Conical Mandrel                        ASTM D 522
  - 3. Pencil Hardness Test                                ASTM D 3363 (H-2H)
  - 4. Impact Resistance Test                             ASTM D 2794
  - 5. Overbake Resistance Test                         ASTM D 2454
  - 6. Salt Spray Resistance Test                        ASTM B 117
  - 7. Abrasion Resistance Test                          ASTM D 4060 (Modified)
  - 8. Humidity Resistance Test                         ASTM D 2247

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security screens.
  - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of security screen connections before frame installation.
  - 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. General: Verify openings for security screens and conditions are satisfactory to accommodate installation of security screens.



- B. Prior to installation, adjust and securely brace security screens for squareness, alignment, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch
2. Alignment: Plus or minus 1/16 inch
3. Plumbness: Plus or minus 1/16 inch

### 3.03 INSTALLATION

- A. General: Install security screens plumb, rigid, properly aligned, and securely fastened in place.
- B. Install as detailed on Drawings and as recommended by Manufacturer. Generally, provide "reveal" or "recessed" mounting" (between jambs) at window locations.
- C. After completion, adjust screens/barrier for proper working order and leave Work clean and free of labels.

### 3.04 ADJUSTMENT AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work including security screens that are warped, bowed, or otherwise unacceptable.
1. Instruct and train City of New York's personnel in the proper operation and maintenance of the installed security window screen assemblies.
- B. Clean grout and other bonding material off security screens immediately after installation.
- C. Touchup: Immediately after erection, smooth abraded, chipped, scratched or otherwise damaged areas of shop finished (powder coated) metals and re-apply the manufacturer's field applied touch-up paint. Touch-up paint system is subject to the acceptance of the Commissioner.
1. Repairs to shop applied finishes which are unacceptable to the Architect shall be removed, and returned to the shop for re-coating; or replaced with new units identical to the systems/finishes specified.

-END OF SECTION-

**Section 08711**  
**DOOR HARDWARE**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Commercial door hardware for the following:
    - a. Swinging doors
    - b. Other doors to the extent indicated
  - 2. Cylinders for doors specified in other Sections
  - 3. Electrified door hardware
- B. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
  - 1. Permanent cores to be installed by City of New York.

**1.02 RELATED SPECIFICATIONS**

- A. Section 08110 Stainless-Steel Doors and Frames for doors and frames to receive door hardware and for astragals provided as part of fire-rated labeled assemblies and for door silencers provided as part of hollow-metal frames.
- B. Section 08311 Access Doors and Frames for access door hardware, including cylinders
- C. Section 08331- Overhead Coiling Doors for cylinder lock requirements
- D. Section 08342-High Speed Fabric Doors for cylinder lock requirements
- E. Section 16121 Wires and Cables – 600 Volts and Below for connections to electrical power system and for low-voltage wiring work
- F. Section 16491 Control Components and Devices for control devices
- G. Division 17 for SCADA System requirements
- H. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

## 1.03 REFERENCES

## A. Codes and standards to follow are:

1. BHMA A156.1 Butt and Hinges
2. BHMA A156.2 Bored and Preassembled Locks and latches
3. BHMA A156.4 Door Controls and Closers
4. UL 305 Panic hardware

## 1.04 SUBMITTALS

## A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

## B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
  - a. System schematic
  - b. Point-to-point wiring diagram
  - c. Riser diagram
  - d. Elevation of each door
2. Detail interface between electrified door hardware and fire alarm access control security building control system.
3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

## C. Samples for verification: Submit minimum 2-by-4-inch plate Samples of each type of finish required, except prime finish.

## D. Product Certificates: For electrified door hardware, signed by product manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

## E. Qualification Data: For Installer and Architectural Hardware Consultant.

## F. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

## G. Warranty: Special warranty specified in this Section.

## H. Other Action Submittals

1. Door Hardware Sets: Prepared by or under the supervision of Installer detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Content: Include the following information:

- (1) Identification number, location, hand, fire rating, and material of each door and frame
- (2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device
- (3) Complete designations of every item required for each door or opening including name and manufacturer
- (4) Fastenings and other pertinent information
- (5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule
- (6) Explanation of abbreviations, symbols, and codes contained in schedule
- (7) Mounting locations for door hardware
- (8) Door and frame sizes and materials
- (9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems
  - (a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
- (10) List of related door devices specified in other Sections for each door and frame

- b. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project

construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing City's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
  1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Commissioner, and City about door hardware and keying.
  2. Installer shall have warehousing facilities in Project's vicinity.
  3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  1. Test Pressure: Test at atmospheric pressure after 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination. In addition to City of New York, Resident Engineer, Contractor, and Commissioner, conference participants shall also include Installer's Architectural Hardware Consultant and City's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion

2. Preliminary key system schematic diagram
  3. Requirements for key control system
  4. Address for delivery of keys
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Review required testing, inspecting, and certifying procedures.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
  - B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
  - C. Deliver keys and permanent cores to City by registered mail or overnight package service.
- 1.07 COORDINATION
- A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Section 03100 - Concrete Forms and Accessories and Section 03200 - Concrete Reinforcement and Section 03300 - Cast-In-Place Concrete.
  - B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies fire alarm system and detection devices, access control system, security system, building control system.
- 1.08 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
      - a. Structural failures including excessive deflection, cracking, or breakage.
      - b. Faulty operation of operators and door hardware.

- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- 2. Warranty Period: Three years from date of Substantial Completion, except as follows:
  - a. Electromagnetic, Delayed-Egress Locks: Five years from date of Substantial Completion.
  - b. Exit Devices: Five years from date of Substantial Completion.
  - c. Manual Closers: 10 years from date of Substantial Completion.
  - d. Concealed Floor Closers: 10 years from date of Substantial Completion.

#### 1.09 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for City's continued adjustment, maintenance, and removal and replacement of door hardware.

### PART 2 PRODUCTS

#### 2.01 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated.
  - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
  - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

## 2.02 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

- B. Template Requirements: Provide only template-produced units.

- C. Hinge Weight: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavyweight hinges
2. Doors with Closers: Antifriction-bearing hinges
3. Interior Doors: Standard-weight hinges

- D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin
2. Interior Hinges: Stainless steel, with stainless-steel pin
3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin

- E. Electrified Functions for Hinges: Comply with the following:

1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
2. Monitoring: Concealed electrical monitoring switch.
3. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

- F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.



2. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors. Finish screw heads to match surface of hinges.

## 2.03 HINGES

- A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Acceptable Manufacturers
  1. Hager Companies (HAG)
  2. PBB, Inc. (PBB)
  3. Stanley Commercial Hardware; Div. of The Stanley Works (STH)
  4. Or approved equal

## 2.04 ELECTRIFIED MORTISE LOCKS:

- A. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1 Listed under Category F in BHMA's "Certified Product Directory."
  1. Provide heavy duty electrified mortise locks providing locking/unlocking functions without unlatching the door.
  2. Provide vandal resistant clutch lever that permits outside lever to operate without retracting the latch when locked.
  3. Mode: Field selectable, Fail-Safe or Fail-Secure, as required by installation and or indicated in Section 08110 - Stainless Steel Doors and Frames.
  4. Function: Field selectable, locked both sides or outside only, as required by installation.
  5. Voltage: Field selectable 12 or 24 VDC, as required by installation.
  6. Hand: Field selectable hand.
  7. Provide internal request-to-exit (R) SPDT Switch
  8. Provide SPDT door position switch to indicate door open or closed.
  9. Provide cable and connector.
  10. Finish: BHMA 630: Satin stainless steel.
  11. Lever trim to be selected by Commissioners from manufacturer's standard models.

## 12. Acceptable Manufacturers

- a. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT)
- b. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH)
- c. Security Door Controls (SDC)
- d. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL)
- e. Or approved equal

## 2.05 POSITION SENSORS

## A. General: Electromagnetic concealed SPDT door position sensor.

1. Coordinate door and frame preparations with door and frame suppliers.
2. Switches shall be installed in frame head approximately 4" from latching door edge.
3. Acceptable Manufacturers
  - a. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT)
  - b. GE Security Industrial
  - c. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL)
  - d. Or approved equal

## 2.06 MECHANICAL LOCKS AND LATCHES

## A. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1 Listed under Category F in BHMA's "Certified Product Directory."

1. Acceptable Manufacturers
  - a. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT)
  - b. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH)
  - c. Security Door Controls (SDC)

- d. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL)
- e. Or approved equal

## 2.07 ELECTROMAGNETIC LOCKS

- A. General: BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."
  - 1. Type: Full exterior or full interior, as required by application indicated
  - 2. Strength Ranking: More than 1200 lbf less than 1700 lbf

## 2.08 ELECTRIFIED CYLINDRICAL LOCKS:

- A. General: Heavy duty BHMA A156.23 electrified lock providing locking/ unlocking functions without unlatching the door.
- B. Vandal resistant clutch lever release with power return spring mechanism. BHMA Grade.
- C. Provide internal request-to-exit (REX) switch.
- D. Finish: BHMA 630: Satin stainless steel

## 2.09 ELECTRIC STRIKES

- A. General: Heavy duty BHMA A156.23 Electric strikes for use with cylindrical locks or mortise locks. Stainless steel construction, tamper resistant, inboard solenoid, heavy-duty construction. Release with 20 lb side load. Horizontal keeper adjustment for door alignment. Non-handed, reversible and plug in connector.
- B. Finish BHMA 630: Satin stainless steel.

## 2.10 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Half-Round Surface Bolts: Minimum 7/8-inch throw.
  - 2. Interlocking Surface Bolts: Minimum 15/16-inch throw.
  - 3. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.
  - 4. Dutch-Door Bolts: Minimum 3/4-inch throw.
  - 5. Mortise Flush Bolts: Minimum 3/4-inch throw.

- B. Dustproof Strikes: BHMA A156.16, Grade 1.
- C. Surface Bolts: BHMA A156.16, Grade 1.
  - 1. Flush Bolt Heads: Minimum of 1/2-inch- diameter rods of brass, bronze, or stainless steel with minimum 12-inch- long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.
  - 2. Acceptable Manufacturers
    - a. Burns Manufacturing Incorporation (BM)
    - b. IVES Hardware; an Ingersoll-Rand Company (IVS)
    - c. Stanley Commercial Hardware; Div. of The Stanley Works (STH)
    - d. Trimco (TBM)
    - e. Or approved equal
- D. Manual Flush Bolts: BHMA A156.16, Grade 1 designed for mortising into door edge.
  - 1. Acceptable Manufacturers
    - a. Burns Manufacturing Incorporation (BM)
    - b. IVES Hardware; an Ingersoll-Rand Company (IVS)
    - c. Stanley Commercial Hardware; Div. of The Stanley Works (STH)
    - d. Trimco (TBM)
    - e. Or approved equal

## 2.11 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1.
- B. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- D. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- E. Outside Trim: Lever with cylinder, Pull, Pull with cylinder; material and finish to match locksets, unless otherwise indicated.
  - 1. Match design for locksets and latchsets, unless otherwise indicated.

F. Through Bolts: For exit devices and trim on metal doors.

G. Acceptable Manufacturers

1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR)
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT)
3. Von Duprin; an Ingersoll-Rand Company (VD)
4. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL)
5. Or approved equal

## 2.12 LOCK CYLINDERS

A. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).

B. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders to be installed by contractor.

C. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
  - a. Replace construction cores with permanent cores and install as directed by City.

D. Acceptable Manufacturer: See Section 2.06.A.1 for a list of acceptable manufacturers.

## 2.13 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.

Existing System: Master key or grand master key locks to City's existing system.

- B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

- a. Notation: "DO NOT DUPLICATE." Information to be furnished by City.

2. Quantity: In addition to one extra key blank for each lock, provide the following:

- a. Cylinder Change Keys: Three
- b. Master Keys: Five
- c. Grand Master Keys: Five
- d. Great-Grand Master Keys: Five

## 2.14 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 700 percent of the number of locks.

1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

- B. Cross-Index System: Multiple index system for recording key information. Include three receipt forms for each key-holding hook. Set up by key control manufacturer.

1. Acceptable Manufacturers

- a. Key Control Systems, Inc. (KCS)
- b. Lund Equipment Co., Inc. (LUN)
- c. Sunroc Corporation (SUN)
- d. Or approved equal

## 2.15 CLOSERS

- A. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- B. Surface Closers: BHMA A156.4, Grade 1. Listed under Category C in BHMA's "Certified Product Directory." Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
  - 1. Acceptable Manufacturers
    - a. LCN Closers; an Ingersoll-Rand Company (LCN)
    - b. Norton Door Controls; an ASSA ABLOY Group company (NDC)
    - c. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX)
    - d. Or approved equal
- C. Coordinators: BHMA A156.3.

## 2.16 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
  - 1. Material: 0.050-inch- thick stainless steel.
  - 2. Acceptable Manufacturers
    - a. Burns Manufacturing Incorporated (BM)
    - b. Rockwood Manufacturing Company (RM)
    - c. Trimco (TBM)
    - d. Or approved equal

## 2.17 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
  - 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

- B. Combination Floor and Wall Stops and Holders: BHMA A156.8, Grade 1.
- C. Combination Overhead Stops and Holders: BHMA A156.8, Grade 1.
- D. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch, fabricated for drilled-in application to frame.
- E. Acceptable Manufacturers
  - 1. Burns Manufacturing Incorporated (BM)
  - 2. Dynalock (DYN)
  - 3. Stanley Commercial Hardware; Div. of The Stanley Works (STH)
  - 4. Trimco (TBM)
  - 5. Or approved equal

## 2.18 DOOR GASKETING

- A. Standard: BHMA A156.22. Listed under Category J in BHMA's "Certified Product Directory."
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, and sound gasketing on interior doors. Provide non-corrosive stainless steel fasteners for exterior applications and elsewhere as indicated.
  - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
  - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.



- E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  - 1. Test Pressure: Test at atmospheric pressure after 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- F. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- G. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- H. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- I. Acceptable Manufacturers
  - 1. Pemko Manufacturing Co. (PEM)
  - 2. Reese Enterprises (RE)
  - 3. Zero International (ZRO)
  - 4. Or approved equal

## 2.19 THRESHOLDS

- A. Standard: BHMA A156.21. Listed under Category J in BHMA's "Certified Product Directory."
- B. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.
- C. Acceptable Manufacturers
  - 1. Pemko Manufacturing Co. (PEM)
  - 2. Reese Enterprises (RE)
  - 3. Zero International (ZRO)
  - 4. Or approved equal

## 2.20 FABRICATION

- A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

- B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  2. Steel Machine: For the following fire-rated applications:
    - a. Mortise hinges to doors
    - b. Strike plates to frames
    - c. Closers to doors and frames
  3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
    - a. Surface hinges to doors
    - b. Closers to doors and frames
    - c. Surface-mounted exit devices
  4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

## 2.21 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Stainless Steel Doors and Frames: Comply with DHI A115 Series.
  - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

### 3.03 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Stainless Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Thresholds: Set thresholds for exterior in full bed of sealant complying with requirements specified in Section 07920 - Exterior Sealants.

### 3.04 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: The City will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports. The Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 3. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

### 3.07 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Section 01821 - Equipment Start-up and Training.

### 3.08 DOOR HARDWARE SETS

- A. See next page for Door Hardware Sets.

**DOOR HARDWARE SETS**

<b>HS1</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
Classroom Lock	ML2055 LWA C6	CR	630
* Hinges	BB51	PBB	630
1 Dummy Set	ML2070 LWA	CR	630
Door Closers	7500	NDC	689
Coordinator	3094	TBM	630
Auto Flush Bolts	3810/3815	TBM	630
Door Bottoms	420APKL	PEM	628
1 Astragal	By Door Mfg.		

<b>HS1A</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Storeroom Lock	ML2057 LWA C6	CR	630
1 Dummy Set	ML2070 LWA	CR	630
2 Door Closer/stop	UNI7500	NDC	689
1 Coordinator	3094	TBM	630
2 Auto Flush Bolts	3810/3815	TBM	630
2 Door Bottoms	420APKL	PEM	628
1 Astragal	By Door Mfg.		
1 Threshold	270A	PEM	628

<b>HS1C</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
Classroom Lock	ML2055 LWA C6	CR	630
1 Dummy Set	ML2070 LWA	CR	630
Door Closers	7500	NDC	689
Coordinator	3094	TBM	630
Auto Flush Bolts	3810/3815	TBM	630
Door Bottoms	420APKL	PEM	628
1 Astragal	By Door Mfg.		
1 Threshold	270A	PEM	628

<b>HS1D</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
2 Door Closer/Stop	UNI7500	NDC	689
1 Coordinator	3094	TBM	630

2 Auto Flush Bolts	3810/3815	TBM	630
2 Door Bottoms	420APKL	PEM	628
1 Astragal	By Door Mfg.		
1 Threshold	270A	PEM	628

<b>HS2</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
Classroom Lock	ML2055LWAC6	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628
1 Threshold	270A	PEM	628

<b>HS3</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Storeroom Lock	ML2057 LWA C6	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628
<b>Threshold</b>	<b>270A</b>	<b>PEM</b>	<b>628</b>

<b>HS3A</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Storeroom Lock	ML2057 LWA C6	CR	630
1 Door Closer/Stop	UNI7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628

<b>HS4</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Office Lock	ML2051 LWA C6	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628

<b>HS4B</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Office Lock	ML2051 LWA C6	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628

1 Threshold	270A	PEM	628
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HS5			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Office Lock	ML2051 LWA C6	CR	630
1 Door Closer/Stop	UNI7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628

HS6			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
1 Door Closer/Stop	UNI7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628

HS6A			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Hinge	BB5062 ETM04	PBB	630
1 Power Supply	5025	DYN	
1 Electrified Lockset	ML20905 LWA C6	CR	630
1 Door Closer	7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628

HS7			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628
<b>1 Threshold</b>	<b>270A</b>	<b>PEM</b>	<b>628</b>

HS7B			
Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628

<b>HS7C</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Hinge	BB5062 ETM04	PBB	630
1 Power Supply	5025	DYN	
1 Exit Device x Trim	ED5400A 9905 L955 xM92	CR	630
1 Wall Stop	1270CxCP	TBM	630
1 Door Closer	7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628

<b>HS8</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
1 Door Closer/Stop	UNI7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628

<b>HS8A</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Exit Device x Trim	ED5400A x L955	CR	630
1 Door Closer/Stop	UNI7500	NDC	689
1 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628

<b>HS9</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Privacy Lock	ML2060 LWA	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	628
Threshold	270A	PEM	628

<b>HS10</b>			
<b>Description</b>	<b>Product</b>	<b>Manufacturer</b>	<b>Finish No</b>
* Hinges	BB51	PBB	630
1 Hinge	BB5062 ETM04	PBB	630
1 Electrified Lockset	ML20904xM92 xLWA xC6	CR	630
1 Power Supply	5025	DYN	
1 Dummy Set	ML2070 LWA	CR	630



on inactive leaf			
1 Magnetic Lock	MagForce 390+	SCH	628
2 Closers	7500	NDC	689
2 Auto Flush Bolt	3810/3815	TBM	630
1 Coordinator	3094	TBM	626
2 Auto Door Bottom	420APKL	PEM	628
1 Weatherstrip	319CN	PEM	628
1 Threshold	270A	PEM	628
1 Astragal	By Door Mfg.		

**HS11**

Description	Product	Manufacturer	Finish No
* Hinges	BB51	PBB	630
1 Hinge	BB5062 ETM04	PBB	630
1 Power Supply	5025	DYN	
1 Electrified Lockset	ML20905xM92x LWAXC6	CR	630
1 Door Closer	7500	NDC	689
1 Wall Stop	1270CxCP	TBM	630
1 Auto Door Bottom	420APKL	PEM	630

**HS12**

Description	Product	Manufacturer	Finish No
1 Cylinder	1080 or 3080	CR	626

\* Number of hinges, as specified

## Finishes

626 Satin Chromium Plated  
 630 Satin Stainless Steel  
 689 Aluminum painted  
 628 Clear Anodized Aluminum

## Abbreviations

BM Burns Manufacturing Incorporated  
 CR Corbin Russwin Architectural Hardware  
 DYN Dynalock  
 IVS IVES Hardware  
 KCS Key Control Systems, Inc  
 LUN Lund Equipment Co., Inc.  
 NDC Norton Door Controls  
 RE Reese Enterprises  
 PEM Pemko Manufacturing Co  
 RIX Rixson Specialty Door Controls  
 RM Rockwood Manufacturing Company

Abbreviations (Continued)

SDC	Security Door Controls
SGT	SARGENT Manufacturing Company
STH	Stanley Commercial Hardware
SUN	Sunroc Corporation
TBM	Trimco
VD	Von Duprin
YAL	Yale Commercial Locks and Hardware

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 08800**  
**GLAZING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Interior and exterior window glazing
  - 2. Doors
  - 3. Glazed openings

**1.02 RELATED SPECIFICATIONS**

- A. Section 05500 - Metal Fabrications
- B. Section 08110 - Stainless Steel Doors and Frames
- C. Section 08520 - Aluminum Windows

**1.03 DEFINITIONS**

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C 1036; provide equivalent thickness in inches.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination

materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
  - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
      - (1) Basic Wind Speed: 125 mph (40 lbs./sq. ft.)
      - (2) Importance Factor: I
      - (3) Exposure Category: A
    - b. Gravity Loads: For horizontal glazing applications, determine gravity loads as per the New York City Building Code.
      - (1) Dead loads
      - (2) Live loads created by snow and personnel access
      - (3) Other loads per code
    - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      - (1) Load Duration: 60 seconds or less
    - d. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
      - (1) For monolithic-glass lites heat treated to resist wind loads

- (2) For insulating glass
  - e. Minimum Glass Thickness for Exterior Lites: Not less than 1/4 inch.
  - f. Thickness of Heat-Absorbing Glass: Provide the same thickness for each heat absorbing glass indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 1/4 inch thick.
  - 2. For insulating-glass units, properties are based on units with lites 1/4 inch and a nominal 1/2-inch- wide interspace.
  - 3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
    - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F
    - b. Solar Heat Gain Coefficient: NFRC 200
    - c. Solar Optical Properties: NFRC 300

#### 1.05 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
  - 1. Float glass
  - 2. Coated vision glass
  - 3. Each color of laminated glass interlayer
  - 4. Insulating glass for each designation indicated
  - 5. Wire glass
  - 6. For each color of exposed glazing sealant indicated

- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
  - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- E. Qualification Data: For installers.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each of the following types of glazing products:
  - 1. Coated float glass
  - 2. Insulating glass
  - 3. Glazing sealants
  - 4. Laminated glass
- H. Warranties: Special warranties specified in this Section.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass with Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
  - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a prior 36-month period.
1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
  2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
  2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials,



except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

- H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual"
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units"

- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.

- J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Commissioner.
2. Build glass mockups by installing the following kinds of glass in mockups specified in "Section 08520 - Aluminum Windows" to match glazing systems required for Project, including glazing methods:
  - a. Heat-strengthened coated glass
  - b. Fully tempered glass
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Coordination.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

## 1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or expected to fall below 40 deg F. during curing period

## 1.09 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, at the Project site, within specified warranty period indicated below.
  - 1. Warranty Period: 10 years from date of Substantial Completion
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, at the Project site, within specified warranty period indicated below.
  - 1. Warranty Period: 10 years from date of Substantial Completion
- C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: Five years from date of Substantial Completion

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

### 2.02 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
  2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
  3. For uncoated glass, comply with requirements for Condition A.
  4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
  5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated, and for horizontal glazing applications.
- C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.
- D. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.
- E. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
1. Interlayer: Polyvinyl butyral or cured resin of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
    - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
    - b. For cured-resin interlayers, laminate lites with laminated-glass manufacturer's standard cast-in-place and cured-transparent-resin interlayer.
- F. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
- G. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of laminated glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal, with primary and secondary sealants as follows:
  - a. Polyisobutylene and polyurethane
4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
  - a. Spacer Material: Stainless steel
  - b. Desiccant: Molecular sieve or silica gel, or blend of both
  - c. Corner Construction: Manufacturer's standard corner construction

## 2.03 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by Commissioner from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
  1. Single-Component Neutral-Curing Silicone Glazing Sealants:
    - a. Available Products: Provide one of the following, or approved equal.
      - (1) GE Silicones; SilPruf SCS2000

- (2) Pecora Corporation; 890
- (3) Tremco; Spectrem 3
- b. Type and Grade: S (single component) and NS (nonsag)
- c. Class: 50
- d. Use Related to Exposure: NT (nontraffic)
- e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O
  - (1) Use O Glazing Substrates: Coated glass and aluminum coated with a high-performance coating

#### 2.04 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure

#### 2.05 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.06 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

## 2.07 INSULATING-GLASS UNITS

- A. Solar-Control Low-E Insulating-Glass Units (Glass Type 1): Transparent Insulating Glass.
  - 1. Overall Unit Thickness and Thickness of Each Lite: As indicated
  - 2. Interspace Content: Air
  - 3. Outdoor Lite: Class 1 (clear) laminated float glass; matching Commissioner's sample
    - a. Kind HS (heat strengthened)
  - 4. Indoor Lite: Class 1 (clear) float glass
    - a. Kind HS (heat strengthened)
  - 5. Low-E Coating: Sputtered on third surface, unless otherwise indicated on the approved sample
  - 6. Visible Light Transmittance: 40 percent minimum
  - 7. Winter Nighttime U-Factor: 0.31 maximum
  - 8. Summer Daytime U-Factor: 0.32 maximum
  - 9. Solar Heat Gain Coefficient: 0.40 maximum
  - 10. Outdoor Visible Reflectance: 0.34percent maximum

11. Applications: Provide 1" thick, solar-control low-E coated insulating glass at all interior and exterior aluminum windows, and other locations indicated.
- B. Heat-Treated Obscure Laminated-Glass Units (Glass Type 2): Obscure Insulating Glass.
  1. Overall Unit Thickness and Thickness of Each Lite: As indicated
  2. Interspace Content: Air
    - a. Outdoor Lite: Provide two layers of 5.0 mm thick heat strengthened, Class 1 (clear) tempered glass factory laminated together with an opaque (white) 0.60" thick pvb interlayer; interlayer translucency matching the Commissioner's sample.
  3. Indoor Lite: Class 1 (clear) float glass
    - a. Kind HS (heat strengthened)
  4. Applications: Provide obscure insulating glazing at exterior toilets and locker room toilet rooms, and other locations indicated.

## 2.08 HORIZONTAL/STRUCTURAL LAMINATED GLAZING

- A. Multi-Ply Laminated Laminated-Glass Units (Glass Type 4): Structural Laminated Safety Glass.
  1. Provide multi-layer structural laminated glass assemblies matching the Commissioner's samples. Structural laminated glass assemblies shall be fabricated from tempered safety glass. Structural laminated glass shall be of the thickness, composition and strength required to meet the New York City Building code requirements, performance criteria specified and span/support spacings indicated on the Drawings.
  2. Prior to fully tempering the glass assemblies, provide bores, holes and other such modifications to the structural glass assemblies (including the grinding and polishing of exposed glass edges) as required to accommodate the stainless steel studs, caps and fittings which secure units to supporting members.
- B. Applications: Provide structural laminated safety glass at canopy glazing, and other locations indicated.

## 2.09 MONOLITHIC WIRED-GLASS UNITS

- A. Polished Wired-Glass Units (Glass Type 3): Wire Glass.
  1. Form 1 (wired glass, polished both sides), Quality-Q6, 6.0 mm thick, Mesh 1 Diamond pattern, unless otherwise selected by the Commissioner.

2. Applications: Provide monolithic wired glazing at fire rated doors and vision panel glazing, and other locations indicated.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners
  2. Presence and functioning of weep system
  3. Minimum required face or edge clearances
  4. Effective sealing between joints of glass-framing members
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

#### 3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.



- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.

- F. Apply heel bead of elastomeric sealant.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.05 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.06 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

- END OF SECTION -

NO TEXT ON THIS PAGE

**Section 09010**  
**ROOM FINISH SCHEDULE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the room finish schedule for the buildings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03350 – Concrete Finishes
- B. Section 07210 - Building Insulation
- C. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Materials associated with this schedule are described in other sections.

**PART 3 EXECUTION****3.01 COORDINATION**

- A. Coordinate use of this room finish schedule with door and hardware schedules.

**SOUTHWEST BROOKLYN TRANSFER STATION**

<u>ROOM No</u>	<u>ROOM NAME</u>	<u>FLOOR</u>	<u>BASE</u>	<u>WALLS</u>	<u>CEILING</u>	<u>CLG HEIGHT</u>	<u>INSULATION</u>	<u>INSULATION</u>	<u>REMARKS</u>
<u>PIER LEVEL</u>									
101	LUNCH ROOM	RF	RF	GCMU	MPC	8'-0"	USA		
102	WOMEN'S LOCKERS AND TOILETS	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	USA		
103	SUPERVISOR'S LOCKERS AND TOILETS	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	USA		
104	MEN'S LOCKERS AND TOILETS	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	USA		
105	JANITOR	FT-1	CT-1	CT-1/CT-2	PC	8'-0"	USA		
106	CORRIDOR	RF	RF	GCMU	MSC	8'-0"	USA		SLATE PANELS
107	UNASSIGNED STORAGE SPACE	SC	-	PCMU	PC	-	USA		
108	SECURITY ROOM	RF	RF	PCMU	PC	-	USA		
109	OFFICE	RF	RF	PCMU	MPC	8'-0"	USA		
110	FIRE PUMP AND METER ROOM	SC	-	PCMU	PC	-	USA		
111	HVAC ROOM	SC	-	PCMU	PC	-	USA		
112	MACHINE SHOP	SC	-	PCMU	PC	-	USA		
113	GALLERY	SC	-	PCMU	PC	-	-		

ROOM No	ROOM NAME	FLOOR	BASE	WALLS	CEILING	CLG HEIGHT	INSULATION	INSULATION	REMARKS
114	CRANE SPARE PARTS STORAGE	SC	-	PCMU	PC	PC	USA		
115	SEPARATOR ROOM	SC	-	PCMU	PC	-	USA		
116	STORAGE 1	SC	-	PCMU	PC	-	USA		
117	STORAGE 2	SC	-	PCMU	PC	-	USA		
118	DRUM STORAGE	SC	-	PCMU	PC	-	USA		
119	STORAGE 3	SC	-	PCMU	PC	-	USA		
120	ELECTRICAL ROOM No 1	SC	-	PCMU	PC	-	USA		
121	ODOR CONTROL	SC	-	PCMU	PC	-	USA		
122	LIDDING ROOM	SC	-	PCMU	*	-	-		* B1/A-522
123	STAIR A	SC	-	PCMU	SWC	9'-0"	-		
124	STAIR B	SC	-	PCMU	SWC	8'-0"	-		
125	STAIR C	SC	-	PCMU	PC	-	-		
126	STAIR D	SC	-	PCMU	PC	-	-		
129	MACHINE SHOP OFFICE	RF	RF	PCMU	MPC	8'-0"	USA		
130	BWAS	SC	-	PCMU	PC	-	-		

## LOADING LEVEL

201	INTERSTITIAL SPACE	SAWP	-	PCMU	PC	-	-		
202	SCALE ROOM	SC	-	PCMU	PC	-	-		
203	INTERIOR RAMP	SAWP	-	PCMU	PC	-	-		
204	LOADING AREA	SH	-	MPP/PC	*	-	-		* B1/A-522
205	VESTIBULE A	SC	-	PCMU	SWC	8'-0"	USA/UFS		
206	MEN'S TOILET 1	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	USA/UFS		
207	WOMEN'S TOILET 1	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	USA/UFS		
208	UPPER LIDDING AREA	SC	-	PCMU	PC	-	-		
209	UNASSIGNED STORAGE	SC	-	PCMU	PC	-	USA/UFS		
210	VESTIBULE B	SC	-	PCMU	PC	-	-		
211	STAIR A	SC	-	PCMU	PC	-	-		
212	STAIR B	SC	-	PCMU	PC	-	-		
213	STAIR C	SC	-	PCMU	SWC	7'-6"	USA		
214	STAIR D	SC	-	PCMU	PC	-	-		
215	VESTIBULE E	SC	-	PCMU	PC	-	-		
216	MAINTENANCE AREA	SC	-	PCMU/ GCMU/PC	*	-	UFS		* B3/A-522
217	SECURE STORAGE	SC	-	PCMU	PC		USA/UFS		
218	OFFICE	RF	-	PCMU	PC	8'-0"	USA/UFS		W/SOFFIT
219	VESTIBULE B	SC	-	PCMU	PC	8'-0"	-		

## TIPPING LEVEL

301	TIPPING AREA	SH	-	*	**	-	-		* A-520 ** B1/A-522
302	FOREMAN'S OFFICE	RF	RF	PCMU	MPC	8'-0"	UFS		
303	VESTIBULE C	RF	RF	PCMU	MPC	8'-0"	UFS		
304	WOMEN'S TOILET 2	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	UFS		
305	MEN'S TOILET 2	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	UFS		
306	VESTIBULE D	RF	RF	RF	MPC	10'-6"	UFS		
307	WOMEN'S TOILET 3	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	UFS		
308	MEN'S TOILET 3	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	UFS		
309	JANITOR	FT-1	CT-1	CT-1/CT-2	MPC	8'-0"	UFS		
310	ELECTRICAL ROOM No 2	SC	-	PCMU	PC	-	-		
311	CATWALK	SC	-	-	-	-	-		

ROOM No	ROOM NAME	FLOOR	BASE	WALLS	CEILING	CLG HEIGHT	INSULATION	INSULATION	REMARKS
312	OPERATIONS ROOM	RF	RF	PCMU	MPC	8'-5"	UFS	BI	W/SOFFIT
313	STAIR A	SC	-	PCMU	PC	-	-		
314	STAIR B	SC	-	PCMU	PC	8'-0"	-		
315	STAIR C	SC	-	PCMU	PC*	-	-		*EXCEPT ROOM 312

## INTERMEDIATE LEVEL

401	STAIR A	SC	-	PCMU	SWC	9'-1"	-		
402	STAIR B	SC	-	PCMU	PC	-	-		

## MECHANICAL MEZZANINE LEVEL

501	MEZZANINE	SC	-	PCMU	*	-	-		* B1/A-522
502	STAIR A	SC	-	PCMU	PC	-	-		
503	STAIR B	SC	SC	PCMU	PC	-	-		

## TRANSFORMER BUILDING

Con Ed. specs. and dwgs. take precedence over contract documents

505	TRANSFORMER	-	-	"	"	"	"		
506	TRANSFORMER	-	-	"	"	"	"		
507	TRANSFORMER	-	-	"	"	"	"		
508	TRANSFORMER	-	-	"	"	"	"		
509	NETWORK PROTECTOR	-	-	"	"	"	"		
510	NETWORK PROTECTOR	-	-	"	"	"	"		
511	NETWORK PROTECTOR	-	-	"	"	"	"		
512	NETWORK PROTECTOR	-	-	"	"	"	"		

## FINISHES DESCRIPTION

PC PAINTED CONCRETE  
MPC= METAL PAN CEILING  
MPP= METAL PUSH PLATES  
MSC= METAL SLATE CEILING  
CT-1= CERAMIC TILE  
CT-2= CERAMIC TILE  
FT-1= FLOOR CERAMIC TILE  
RF= RESINOUS FLOORING  
GCMU= GLAZED CMU BLOCK  
GYPB= GYPSUM BOARD  
PCMU= PAINTED CONCRETE  
MASONRY UNIT  
SC= SEALED CONCRETE,  
TYPE 'G' FINISH (SEE  
SECTION 03350 -  
CONCRETE  
FINISHES)  
SH= SURFACE HARDENED  
CONCRETE, TYPE 'H'  
FINISH (SEE SECTION  
03350 - CONCRETE  
FINISHES)  
SWC= SHAFT WALL CEILING SEE  
REFLECTED CEILING PLANS  
BI= 6" BATT INSULATION  
SAWP= SURFACE APPLIED  
INTERIOR WATER-  
PROOFING OVER  
TYPE 'C' CONCRETE

<u>ROOM No</u>	<u>ROOM NAME</u>	<u>FLOOR</u>	<u>BASE</u>	<u>WALLS</u>	<u>CEILING</u>	<u>CLG</u> <u>HEIGHT</u>	<u>INSULATION</u>	<u>INSULATION</u>	<u>REMARKS</u>
	FINISH (SEE SECTION 03350 - CONCRETE FINISHES)								
REMARK NOTES									
UFS= UNDER FLOOR SLAB									
USA= UNDER SLAB ABOVE									

-END OF SECTION-

**Section 09260**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Interior gypsum for ceilings and soffits.
  - 2. Non-load-bearing steel framing.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05400 "Cold-Formed Metal Framing" for load-bearing steel framing.
- B. Section 07210 "Building Insulation"
- C. HVAC related Sections for air distribution components pertinent to ceiling system.
- D. Electrical related Sections for lighting components pertinent to ceiling system.
- E. Plumbing related Sections for fire sprinklers

**1.03 DEFINITIONS**

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

**1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's descriptive literature indicating material composition, thickness, sizes and fire resistance for each type of product indicated.
- B. Shop Drawings: Show locations, fabrication and installation of control and expansion joints including plans, elevations, sections, details of components and attachments to other units of Work.
- C. Samples: For the following products:
  - 1. Trim Accessories: Full-size sample in 12-inch- long length for each trim accessory indicated.
  - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.
- D. Submit manufacturer's written certification that product meets specified requirements.



## 1.05 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory".
- B. Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Install mockups for the following applications:
    - a. Surfaces with texture finish
    - b. Surfaces indicated to receive non-textured paint finishes
    - c. Surfaces indicated to receive textured paint finishes.
  - 2. Simulate finished lighting conditions for review of mockups.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier and the type and thickness of the gypsum board. Stamped with an Underwriters Laboratories, Inc. label documenting UL Classification for fire resistance, surface burning characteristics and non-combustibility.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

## 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Steel Framing and Furring:
  - 1. Clark Steel Framing Systems
  - 2. Consolidated Systems, Inc.
  - 3. Unimast, Inc.
  - 4. Western Metal Lath & Steel Framing Systems

## B. Gypsum Board and Related Products

1. American Gypsum Co.
2. G-P Gypsum Corp.
3. National Gypsum Company
4. United States Gypsum Co.

## 2.02 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated. Provide components approved for use in New York City by the NYC Building Code.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

## C. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

a. Type: Post-installed, chemical anchor, Post-installed, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

## D. Hangers

1. Rod Hangers: ASTM A 510, mild carbon steel.

a. Diameter: 1/4-inch

b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized

2. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G60, hot-dip galvanized.

a. Size: 1 by 3/16 inch by length indicated

3. Angle Hangers: ASTM A 653/A 653M, G60, hot-dip galvanized commercial-steel sheet.

a. Minimum Base Metal Thickness: 0.0312 inch

b. Size: 1-5/8 by 1-5/8 inches

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with, ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

1. Depth: 1-1/2 inches

- F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized.

1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange, 3/4 inch deep.

2. Steel Studs: ASTM C 645. Size and spacing to comply with requirements for indicated spans.

a. Minimum Base Metal Thickness: 0.0312 inch

b. Depth [1-5/8 inches, 2-1/2 inches, 3-5/8 inches

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep

a. Minimum Base Metal Thickness: 0.0312 inch

- G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide by one of the following:

a. Armstrong World Industries, Inc.; Furring Systems/Drywall

b. Chicago Metallic Corporation Drywall Furring 640 System

c. USG Interiors, Inc.; Drywall Suspension System

## 2.03 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047

1. Material: aluminum-coated steel sheet

a. LC bead: J shaped; exposed long flange receives joint compound

b. L Bead: L shaped; exposed long leg receives joint compound

c. U Bead: J shaped; exposed short flange does not receive joint compound; use at exposed panel edges.

- B. Zinc Expansion (Control) Joint: Use where indicated.

## 2.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape
  - 1. Interior Gypsum Soffit Board: Paper
- C. Joint Compound for Interior Gypsum: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type.
  - 4. Finish Coat: For third coat, use drying-type.
  - 5. Skim Coat: For final coat of Level 5 finish, use drying-type.

## 2.05 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Acoustical Sealant for Exposed and Concealed Joints
    - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant
    - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, non-staining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, recommended for sealing interior concealed joints to reduce airborne sound transmission.

## 2.06 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool or rock wool.
  - 1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.
- E. Thermal Insulation: As specified in Section 07210 "Building Insulation".

## 2.07 TEXTURE FINISHES

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Polystyrene Aggregate Ceiling Finish
    - a. G-P Gypsum Corp.; GyProc Ceiling Texture/Polystyrene
    - b. National Gypsum Company; Gold Bond Perfect Spray
    - c. United States Gypsum Co.; SHEETROCK Ceiling Spray Texture, QT Polystyrene
- B. Primer: As recommended by textured finish manufacturer.
- C. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indices of not more than 25 when tested according to ASTM E 84.
  - 1. Texture: Fine

## 2.08 GYPSUM BOARD

- A. Products: Subject to have a non-combustible, moisture and mold-resistant gypsum core. UL classified for fire resistance (Type X).
  - 1. Provide "Humitek Gypsum Panels" by USG or comparable products by Georgia Pacific and National Gypsum.
  - 2. Provide 5/8" thickness unless otherwise indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

### 3.03 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

- B. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
  - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
- C. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

### 3.04 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Space hangers to comply with referenced Standards but not to exceed 48 inches on center.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 3. Secure rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 4. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 5. Do not attach hangers to steel deck tabs.
  - 6. Do not attach hangers to steel roof deck. Attach hangers to structural members. Coordinate hanger roof attachment with Structural drawings and consult with the Commissioner.
  - 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.

- D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
- E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
  - 1. Carrying Channels (Main Runners): 48 inches
  - 2. Furring Channels (Furring Members): 16 inches
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

### 3.05 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.



2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffer, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffer, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

### 3.06 PANEL APPLICATION METHODS

#### A. Single-Layer Application

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

#### B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

#### C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

#### D. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws. Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

### 3.07 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by the Commissioner for visual effect.

### 3.08 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare

gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

- B. Prefill open joints beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
  - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
  - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated.
  - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated.

### 3.09 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, the Commissioner will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  - 1. Notify the Commissioner seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
  - 2. Before notifying the Commissioner, complete the following in areas to receive gypsum board ceilings:
    - a. Installation of 80 percent of lighting fixtures, powered for operation.
    - b. Installation, insulation, and leak and pressure testing of water piping systems.
    - c. Installation of air-duct systems.
    - d. Installation of air devices.

- e. Installation of mechanical system control-air tubing.
- f. Installation of ceiling support framing.

-END OF SECTION -

**Section 09265**  
**GYPSUM BOARD SHAFT-WALL ASSEMBLIES**

**PART 1 GENERAL****1.01 SUMMARY**

A. This Section includes the following:

1. Shaft wall enclosures
2. Chase enclosures
3. Soffit enclosures

**1.02 RELATED SPECIFICATIONS**

- A. Section 05400 - Cold-Formed Metal Framing, for load-bearing steel framing
- B. Section 07811 - Sprayed Fire-Resistive Materials
- C. Section 09260 - Gypsum Board Assemblies, for applying and finishing panels in gypsum board shaft-wall assemblies

**1.03 DEFINITIONS**

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide gypsum board shaft-wall assemblies capable of while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.

**1.05 SUBMITTALS**

- A. Product Data: For each gypsum board shaft-wall assembly indicated.
- B. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.
- C. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.

- D. Acoustical-Test-Response Reports: From a qualified independent testing agency substantiating required STC rating for each gypsum board shaft-wall assembly.

#### 1.06 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."
- B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- C. Pre-installation Conference: Review methods and procedures for installing work related to gypsum board shaft-wall assemblies including, but not limited to, the following:
  - 1. Fasteners proposed for anchoring steel framing to building structure
  - 2. Sprayed fire-resistive materials applied to structural framing
  - 3. Wiring devices in shaft-wall assemblies
  - 4. Doors and other items penetrating shaft-wall assemblies
  - 5. Items supported by shaft-wall-assembly framing
  - 6. Mechanical work enclosed within shaft-wall assemblies

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

#### 1.08 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Section 09620 - Gypsum Board Assemblies

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

A. Provide the named product or a comparable product by one of the following:

1. American Gypsum Co.
2. G-P Gypsum Corp.
3. National Gypsum Company
4. United States Gypsum Co.

## 2.02 ASSEMBLY MATERIALS

A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Steel Framing: ASTM C 645.

1. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized coating

C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch thickness and with moisture-resistant paper faces.

D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.

1. Edges: Tapered for prefilling

E. Gypsum Base for Gypsum Veneer Plaster: ASTM C 588, core type as required by fire-resistance-rated assembly indicated, with edges as standard with manufacturer.

F. Water-Resistant, Gypsum Backing Board: ASTM C 630/C 630M, core type as required by fire-resistance-rated assembly indicated.

G. Cementitious Backer Units: ANSI A118.9, in manufacturer's standard thickness, but at least 1/2 inch thick.

H. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 09260 - Gypsum Board Assemblies that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

- I. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Section 09620 - Gypsum Board Assemblies.
- J. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- K. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
  - 1. Powder-Actuated Fasteners: Provide powder-actuated fasteners with capability to sustain, without failure, a load equal to 10 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 1190.
  - 2. Postinstalled Expansion Anchors: Where indicated, provide expansion anchors with capability to sustain, without failure, a load equal to 5 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 488.
- L. Acoustical Sealant: As recommended by gypsum board shaft-wall assembly manufacturer for application indicated.

## 2.03 GYPSUM BOARD SHAFT WALL

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Deflection Limit:  $L/360$
- C. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
  - 1. Depth: 2-1/2 inches
  - 2. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.
- D. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches, in depth matching studs.
  - 1. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.

## 2.04 TEXTURE FINISHES

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Polystyrene Aggregate Ceiling Finish:
    - a. G-P Gypsum Corp.; GyProc Ceiling Texture/Polystyrene
    - b. National Gypsum Company; Gold Bond Perfect Spray
    - c. United States Gypsum Co.; SHEETROCK Ceiling Spray Texture, QT Polystyrene
- B. Primer: As recommended by textured finish manufacturer.
- C. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indices of not more than 25 when tested according to ASTM E 84.
  - 1. Texture: Fine

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Section 07811 - Sprayed Fire-Resistive Materials.
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-



resistance rating indicated. Protect remaining fire-resistive materials from damage.

### 3.03 INSTALLATION

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
  - 1. ASTM C 754 for installing steel framing
  - 2. Section 09260 - Gypsum Board Assemblies for applying and finishing panels
- B. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- C. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.
- D. Install control joints to maintain fire-resistance rating of assemblies.
- E. Seal gypsum board shaft walls with firestopping sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install firestopping sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.
- F. Shaft walls Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
  - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
  - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated.
  - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated.

-END OF SECTION-

**Section 09310**  
**CERAMIC TILE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Porcelain mosaic tile
  - 2. Waterproof membrane for thin-set tile installations
  - 3. Crack-suppression membrane for thin-set tile installations
  - 4. Metal edge strips installed as part of tile installations

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates
- B. Section 04201 "Unit Masonry"
- C. Section 07921 "Interior Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces
- D. Section 09010 "Room Finish Schedule"

**1.03 DEFINITIONS**

- A. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

**1.04 REFERENCES**

- A. ANSI A108.5 – Installation Specification for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
- B. ANSI A118.1 – Specifications for Dry-Set Portland Cement Mortar
- C. ANSI A137.1 – Specification for Ceramic Tile
- D. Tile Council of America, Inc. (TCA) – Handbook for Ceramic Tile Installation.

**1.05 SUBMITTALS**

- A. Product Data and Tile Layout Drawings: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Master Grade Certificate signed by the tile manufacturer and Contractor certifying grade, class, kind, type and quality of tile which grade certificate applies and

containing adequate information for identification of packages of the tile to be delivered for work

D. Certificates from manufacturers of mortars, adhesives, grouts and sealant attesting that materials meet the requirements of the work.

E. Samples for Verification:

1. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 4 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.

F. Qualification Data: For Installer.

#### 1.06 QUALITY ASSURANCE

A. Provide tile, grout and setting materials from one source. Additives, dry-set mortars, installation materials and grouts shall be from the same manufacturer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling grade-sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

#### 1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.02 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
  1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
  1. As selected by Commissioner from manufacturer's full range.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.
  1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

## 2.03 TILE PRODUCTS

- A. Manufacturers
  1. American Olean
  2. Daltile; Div. of Dal-Tile International Inc.
  3. Lone Star Ceramics Company
  4. Metropolitan Ceramics
  5. Summitville Tiles, Inc.
  6. United States Ceramic Tile Company

B. Unglazed Ceramic Mosaic Tile: Factory-mounted flat tile as follows:

1. Composition: Porcelain
2. Surface: Smooth, Slip-resistant, with abrasive admixture
3. Module Size: 2 by 2 inches
4. Nominal Thickness: 1/4 inch
5. Face: Plain with cushion edges
6. Face: Plain
7. Use at: floors

C. Glazed Ceramic Mosaic Tile: Factory-mounted flat tile as follows:

1. Composition: Porcelain
2. Surface: Smooth glazed
3. Module Size: 2 by 2 inches
4. Nominal Thickness: 1/4 inch
5. Face: Plain with cushion edges
6. Face: Plain
7. Use at: Walls

D. Ceramic Mosaic Trim Units for thin-set Mortar Installations: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as necessary selected from manufacturer's standard shapes as follows but not limited to

1. Base Cove: Cove, module size 2 by 2 inch
2. Base Cap for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches
3. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches
4. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches

2.04 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

- B. Solid Polymer Thresholds: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without pre-coated finish.

- a. Avonite, Inc.
- b. DuPont Polymers
- c. Formica Corporation
- d. Nevamar; International Paper; Decorative Products Division

2.05 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

- A. General: Manufacturer's standard product that complies with ANSI A118.10.
- B. Polyethylene-Sheet Product: Polyethylene faced on both sides with fleece webbing for adhering to latex-portland cement mortar; 39 inches wide by 0.008-inch nominal thickness.

1. Product: Schluter Systems L.P.; KERDI

2.06 SETTING AND GROUTING MATERIALS

- A. Manufacturers:

1. LATICRETE International Inc.
2. MAPEI Corporation
3. Southern Grouts & Mortars, Inc.
4. Summitville Tiles, Inc.

- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.

- a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

- C. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated

2.07 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Section 07921 – Interior Sealants.

- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products

- a. Dow Corning Corporation; Dow Corning 786
- b. GE Silicones; Sanitary 1700
- c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant
- d. Tremco, Inc.; Tremsil 600 White

2.08 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout or tile.

1. Custom Building Products; Grout Sealer
2. MAPEI Corporation; KER Tile Grout 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile
3. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer
4. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer

2.09 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.

- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Commissioner.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
  - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.



### 3.03 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 07921 – Interior Sealants.
- G. Grout tile to comply with requirements of the following tile installation standards:
  - 1. For ceramic tile grouts portland cement; comply with ANSI A108.10.

### 3.04 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

- C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

### 3.05 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
  - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
    - a. Tile floors in wet areas
- B. Joint Widths: Install tile on floors with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/8 inch
  - 2. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- D. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

### 3.06 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.
- C. Joint Widths: Install tile on walls with the following joint widths:
  - 1. Porcelain Mosaic Tile: 1/8 inch.

### 3.07 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-portland cement grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
  - C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
  - D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

### 3.08 FLOOR TILE INSTALLATION SCHEDULE

- A. Tile Installation FTI-1: Interior floor installation on concrete; thin-set mortar.
  1. Tile Type: Unglazed porcelain mosaic
  2. Thin-Set Mortar: Latex- portland cement mortar
  3. Grout: Unsanded cement grout
- B. Tile Installation FTI-2: Interior floor installation on waterproof crack-suppression membrane over concrete; thin-set mortar.
  1. Tile Type: Unglazed porcelain mosaic
  2. Thin-Set Mortar: Latex-portland cement mortar
  3. Grout: Polymer-modified sanded grout

### 3.09 WALL TILE INSTALLATION SCHEDULE

- A. Tile Installation WTI-1: Interior wall installation over masonry or concrete; thin-set mortar.
  1. Tile Type: Glazed procelain mosaic tile
  2. Thin-Set Mortar: Latex- portland cement mortar
  3. Grout: Sanded cement grout

B. Tile Installation WTI-2: Interior wall and shower-receptor installation over solid backing, thin-set mortar.

1. Tile Type: Glazed porcelain mosaic tile
2. Thin-Set Mortar: Latex- portland cement mortar
3. Grout: Sanded cement grout

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 09513**  
**ACOUSTICAL SNAP-IN METAL PAN CEILINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes interior plank and panel type ceiling system assemblies, consisting of pre-finished aluminum pans mounted to carrier system and incorporating lighting fixtures and air handling components for ceilings.
  - 1. Metal ceiling panels
  - 2. Suspension assemblies
  - 3. Perforations
  - 4. Sound absorbing materials
  - 5. Accessories; provide all other necessary items including devices for attachments to overhead construction, secondary members, splines, splices connecting clips, wall connectors, wall angles and all other devices required for a complete installation.
  - 6. Coordinate items penetrating or being integrated into ceiling systems with responsible trades.

**1.02 RELATED SPECIFICATIONS**

- A. Sections related to Plumbing for fire suppression
- B. Sections related to HVAC for mechanical equipment and air distribution components pertinent to integrated ceiling system.
- C. Sections related to Electrical for lighting components pertinent to integrated ceiling system.

**1.03 DEFINITIONS**

- A. CAC: Ceiling Attenuation Class
- B. LR: Light Reflectance coefficient
- C. NRC: Noise Reduction Coefficient

**1.04 PERFORMANCE REQUIREMENTS**

- A. ASTM C635 Specification for Metal Suspension for Acoustical tile and Lay-In Panel ceiling

- B. ASTM C636 Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- C. Seismic Performance: Provide acoustical snap-in metal pan ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
  - 2. Building Code of The City of New York
- D. ASTM C423: Test Method for Sound Absorption coefficients by the Reverberation Room Method.

#### 1.05 SUBMITTALS

- A. Product Data: Submit catalog cuts or standard drawings showing details of system with project conditions clearly identified and manufacturer's recommended installations for each type of product indicated.
  - 1. Ceiling suspension members
  - 2. Method of attaching hangers to building structure
  - 3. Ceiling perimeter and penetrations through ceiling
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Metal Pan: Set of 12-inch-long Samples of each type, finish, color, pattern, and texture
  - 2. Exposed Moldings and Trim: Set of 12-inch- long Samples of each type, finish, and color.
  - 3. Sound Absorber: Match size of Sample metal pan.
- C. Shop Drawings
  - 1. Reflected ceiling plans (1/4"=1'-0" minimum scale): Contractor shall indicate layout arrangement of ceiling design, dimensions and location of related integrated lighting and air distribution components. Show all locations, markings, quantities, materials, sizes and shapes. Indicate all method of connecting, anchoring, fastening, bracing and attaching to work of other trades.
  - 2. Installation drawings: Detail complete installation including carrier system, connections between carriers and pans, details of level changes and/or changes in pattern, installation of related lighting and air distribution components, access requirements, sound absorption requirements.

- D. Qualification Data: For professional engineer and testing agency.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical snap-in metal pan ceiling.
- F. Research/Evaluation Reports: For acoustical snap-in metal pan ceiling and components.
- G. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.06 QUALITY ASSURANCE

- A. Materials shall be installed in accordance with procedures recommended by the manufacturer and shall meet the requirement of the regulatory agencies: Building Code of the City of New York
- B. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
  - 1. Changes from system: System performance following any substitution of materials or change in assembly design must be certified by the manufacturer.
- C. Source Limitations: Obtain each set of acoustical snap-in metal pans and concealed suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.
- D. Fire-Test-Response Characteristics: Provide acoustical snap-in metal pan ceilings with surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference: Conduct conference at Project site prior to final installation.
- G. The contractor responsible for the work of this section shall be qualified and experienced in performance of this work and done so for no less than a period of three (3) years.



## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical snap-in metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

## 1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical snap-in metal pan ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature range of 60 degree F to 85 degree F and humidity of not more than 70% are maintained at the levels indicated for Project when occupied for its intended use.

## 1.09 COORDINATION

- A. Coordinate layout and installation of acoustical snap-in metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
  - 1. Mechanical Work: Ductwork above ceiling will be complete, and permanent heating and cooling systems operation to climate conditions prior to installation of linear metal ceiling components
  - 2. Electrical Work: Installation of conduit above the ceiling shall be completed before installation of linear metal ceiling components.
  - 3. Fire protection: Fire protection lines and/or equipment occurring above ceiling shall be completed and tested before linear metal ceiling components are installed.

## PART 2 PRODUCTS

### 2.01 ACOUSTICAL SNAP-IN METAL CEILING PANS

- A. Sheet Metal Characteristics: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
  - 1. Aluminum Sheet: Rolled-formed aluminum sheet, complying with ASTM B209 (ASTM B209M); alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
  - 2. The ceiling panels are to be brake die formed from a single sheet and formed with a min. 1-1/4" integral return edge on all panel sides. No indentations,

marks or defacing of the exposed surface of the metal ceiling panel will be allowed.

3. No fasteners of any kind shall be visible on exposed face surfaces of ceiling panels or support tees. Down light openings and sprinkler openings shall be factory precision cut as required.
4. The plenum shall be 100% accessible. Every panel must be removable. Heavy duty torsion springs and clip assemblies to be mounted to every panel for downward access, without potential for damage to panel face or hinge assembly. Hinge assembly shall be attached to panel with min. 2 flush fasteners. Attaching torsion spring directly to panel with fastener will not be accepted.
5. Sound absorbing material to be a gray or black, non-woven fabric with Class 1 fire rating. Perforated panels with absorbing material to achieve an N.R.C. of .70-.80 min. with a min. 7" clear plenum.
6. Perforation pattern to be selected by architect from manufacture's catalog. Panels to have a solid margin, non-perforated on all sides.

## 2.02 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM B209 (ASTM B209M) requirements.
  1. Comply with requirements of NYC Building Code for Primary Suspension System.
  2. Primary Suspension System consisting of 1 1/2" cold-rolled carrier channels at 4'-0" on center suspended from building structure by 1/4" diameter rods at 4'-0" on center (max.) connected with approved devices.
- B. Suspension Systems: Provide systems complete with snap-in carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.
- C. Supporting grid system shall consist of straight, factory formed tee in adequate thickness, to support loads. Finish tee to match modular ceiling panels where exposed. Tee shall be factory slotted to accept torsion spring attachment.
- D. Tolerance: Maximum deflection of ceiling panels from edge to edge in width shall not exceed 1/4" in 10'-0" when measured with a straightedge placed at any directional location on the finished surfaces. Maximum deviation shall not exceed 1/4" from level in any area or room.

## 2.03 INDIRECT-HUNG METAL SUSPENSION SYSTEMS

- A. System designed to support metal pans that snap into main runners, consisting of main runners connected to carrying channels that are attached by hangers to building structure, and complying with the following requirements:
  - 1. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
    - a. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
  - 2. Main Runners: Formed from the following metal:
    - a. Main tee, 25-gauge commercial quality cold rolled steel; face-capped during forming; factory finished in baked enamel paint finish
    - b. Carrying Channels: Aluminum channel shape, each leg notched for locating attaching pans.

## 2.04 ALUMINUM PANS AND SUSPENSION SYSTEM FOR ACOUSTICAL SNAP-IN METAL PAN CEILING

- A. Products
  - 1. Alcan Building Products: Planar
  - 2. Ceilingplus – Illusion and Mirra Metal Ceiling System
  - 3. Hunter Douglas: Linear Metal Ceiling Type 84R Linear
  - 4. USG Interiors, Inc.
  - 5. Or approved equal
- B. Classification: Units complying with ASTM E 1264 for Type VI, perforated aluminum (pan) with mineral- or glass-fiber-base backing
  - 1. Pattern: A (perforated, regularly spaced large holes), arranged in parallel alignment to pan edge with uniform perforations of 0.109-inch diameter, 1800 holes/sq. ft., and 11.8 percent open area.
- C. Pan Thickness: Not less than 0.0250 inch.
- D. Pan Edge Detail: Beveled.
- E. Pan Size: 12 in wide face for linear panel type, 2 ft by 2 ft for square panel type.
- F. Suspended ceiling Type 1: square panel
- G. Suspended ceiling Type 2: Linear panel
- H. Pan Face Finish: Baked enamel paint finish

- I. NRC: Not less than 0.75.
- J. Suspension-System Installation Method: Indirect-hung snap-in suspension system.
- K. Suspension-System Classification: Snap-tee, intermediate.

## 2.05 ACOUSTICAL SEALANT

### A. Acoustical Sealant for Exposed and Concealed Joints

- 1. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant
- 2. United States Gypsum Co.; SHEETROCK Acoustical Sealant
- 3. Or approved equal

### B. Acoustical Sealant for Concealed Joints

- 1. OSI Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant
- 2. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant
- 3. Pecora Corp.; BA-98
- 4. Tremco, Inc.; Tremco Acoustical Sealant
- 5. Or approved equal

## 2.06 ACCESSORIES

- A. Access Panels: For access at locations indicated, provide acoustical snap-in metal pan ceiling units, accessible by two access knobs; place one access knob at each end of panel near corners.
- B. Access Tool: Provide manufacturer' standard tool for opening access panels.

## 2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.08 FABRICATION

- A. Pans: Edges formed to snap onto carrier members and provide positive locking mechanism with no additional fasteners; factory-finished to match approved samples. Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated with dimples or continuous beads on flanges for snap-in engagement with concealed suspension system.

- B. Support System: Formed and fabricated for mechanical connection with adjoining section and pre-punched holes for direct suspension.
- C. Lighting components: Fabricate in accordance with UL classification as specified.
- D. Air distribution components: Formed to provide airtight assembly and positive connection to mechanical equipment components.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical snap-in metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical snap-in metal pan ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical snap-in metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans.

### 3.03 INSTALLATION

- A. General: Install acoustical snap-in metal pan ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
  - 1. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate both for structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 2. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors that extend through forms into concrete.
  - 3. Do not attach hangers to steel deck tabs.
  - 4. Do not attach hangers to steel roof deck. Attach hangers to structural members.

5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical snap-in metal pans.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- D. Cut acoustical snap-in metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- E. Install acoustical snap-in metal pans in coordination with suspension system and exposed moldings and trim.
1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated.
  2. Fit adjoining units to form flush, tight joints.
  3. Install sound-absorbent fabric layers in perforated metal pans.
  4. Install sound-absorbent pads in metal pans.
- F. Install linear panels leaving a 3/4" gap in between to allow air to flow through the entire ceiling.

3.04 CLEANING

Clean exposed surfaces of acoustical snap-in metal pan ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

-END OF SECTION-

**Section 09671**  
**RESINOUS FLOORING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes resinous flooring systems with epoxy resin body coat.
  - 1. Application Method: Troweled

**1.02 RELATED SPECIFICATIONS**

- A. Section 07921 - Joint Sealants for sealants installed at joints in resinous flooring systems.
- B. Section 09010 - Room Finish Schedule

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
  - 1. Provide sample of integral cove base with floor to wall and wall to wall corner condition.
- D. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings and in Section 09010 - Room Finish Schedule.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Material Test Reports: For each resinous flooring component.
- G. Material Certificates: For each resinous flooring component, signed by manufacturer.
- H. Maintenance Data: For resinous flooring to include in maintenance manuals.

**1.04 QUALITY ASSURANCE**

- A. Installer qualifications: Engage an installer who employs trained applicators, approved by resinous flooring manufacturer for installing resinous flooring systems specified.



**B. Pre-Installation Conference**

1. The Contractor shall arrange a meeting less than thirty days prior to starting work, comply with requirements of Section 01310 - Project Coordination.
2. Attendance
  - a. General Contractor
  - b. Commissioner/City Representative
  - c. Manufacturer/Installer's Representative

C. ISO 9002: All materials, including primers, resins, curing agents, finish coats; aggregates and sealants are manufactured and tested under ISO 9002 registered quality system.

D. Concrete substrate must be properly cured for a minimum of 30 days.

E. Protection of finished floor from damage by subsequent trades to be responsibility of General Contractor.

F. Single Source: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than three (3) years of successful experience in manufacturing and installing principal materials described in this section. Engage an installer who has completed at least three projects of similar size and complexity. Provide secondary material only of type and from source recommended by manufacturer of primary materials only.

G. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- square corner floor area selected by Commissioner.
  - a. Include 48-inch length of integral cove base on each wall.
2. Simulate finished lighting conditions for Commissioner's review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

## 1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
  - 1. Protect areas from dust during installation and curing.

## PART 2 PRODUCTS

### 2.01 RESINOUS FLOORING

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Crossfield Products Corp., Terracolor;
  - 2. General Polymers Corporation, a division of the Sherwin-Williams Company, Ceram #100;
  - 3. Stonhard, Inc., Stoneblend GSI
  - 4. Or approved equal
- B. System Characteristics:
  - 1. Color and Pattern: As selected by Commissioner from manufacturer's full range
  - 2. Wearing Surface: Smooth
  - 3. Integral Cove Base: 8 inches high
  - 4. Overall System Thickness: 3/16 inch
- C. System Components: Manufacturer's standard components that are compatible with each other and as follows:
  - 1. Body Coat(s)
    - a. Resin: Epoxy
    - b. Formulation Description: 100 percent solids
    - c. Application Method: Screed applied and Finished Troweled
      - (1) Thickness of Coats: 3/16 inch
      - (2) Number of Coats: One

- d. Aggregates: Colored quartz (ceramic-coated silica)
- 2. Primer: Type recommended by manufacturer for substrate and body coat(s) indicated.
  - a. Formulation Description: 100 percent
- 3. Topcoat: Chemical-resistant
  - a. Resin: Epoxy
  - b. Formulation Description: 100 percent solids
  - c. Type: Clear
  - d. Finish: Matte
  - e. Number of Coats: Two
- 4. Final Topcoat: Chemical and UV-resistant
  - a. Resin: Urethane
  - b. Formulation Description: 100 percent solids
  - c. Type: Clear
  - d. Finish: Matte
  - e. Number of Coats: Two
- D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
  - 1. Compressive Strength: 6000 psi per ASTM C 579
  - 2. Tensile Strength: 1500 psi per ASTM C 307
  - 3. Flexural Modulus of Elasticity:  $5.0 \times 10^5$  psi per ASTM C 580
  - 4. Water Absorption: 0.2% per ASTM C 413
  - 5. Coefficient of Thermal Expansion:  $1.8 \times 10^{-5}$  in/in  $^{\circ}\text{C}$  per ASTM C 531
  - 6. Impact Resistance: >160 in. lbs. per ASTM D-4226
  - 7. Heat Resistance Limitation:  $140^{\circ}\text{F}$  (for continuous exposure) and  $200^{\circ}\text{F}$  (for intermittent spills)
  - 8. Abrasion Resistance: 0.006 gm maximum weight loss per ASTM D 4060, CS-17 wheel
  - 9. Flammability: Self-extinguishing per ASTM D 635

10. Hardness: 85-90, Shore D per ASTM D 2240

11. Bond Strength: >400 psi, 100 percent concrete failure per ASTM d-4541

## 2.02 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
  - 1. Roughen concrete substrates as follows:
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
  - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
  - 3. Verify that concrete substrates are dry.
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
    - c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform Ph test per ASTM E1907-97. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

### 3.02 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
  1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
    - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.
- D. Apply troweled or screeded coat(s) in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.
- E. Apply epoxy grout (double coat), of type recommended by resinous flooring manufacturer to fill voids in surface of final body coat and to produce wearing surface indicated.

- F. Apply Polyurethane topcoat(s) (double coat) indicated for flooring system and at spreading rates recommended in writing by manufacturer.

### 3.03 FIELD QUALITY CONTROL

- A. Core Sampling: At the direction of City and at locations designated by City, take 1 core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.
- B. Material Sampling: City may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
  - 1. The City will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
  - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

### 3.04 CLEANING AND PROTECTING

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 09911**  
**EXTERIOR PAINTING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes surface preparation and field application of exterior paint/high-performance coating systems to the following exterior items and surfaces.
  - 1. Bollards, fences and railings
  - 2. Exposed structural steel
  - 3. Exposed metal fabrications
  - 4. Exposed concrete
  - 5. Exposed electrical panel covers and devices
  - 6. Miscellaneous surfaces and substrates that would otherwise be exposed in the completed work

**1.02 RELATED SPECIFICATIONS**

- A. Section 02821 - Metal Fence
- B. Section 02822 - Ornamental Fences and Gates
- C. Section 03300 - Cast-In-Place Concrete
- D. Section 05120 - Structural Steel
- E. Section 05500 - Metal Fabrications
- F. Section 09912 - Interior Painting
- G. Section 09967 - Coatings For Steel Waterfront Structures
- H. Sections related to Electrical Work

**1.03 DEFINITIONS**

- A. Standard coating terms defined in ASTM D 16 apply to this Section.
- B. Gloss ranges used in this Section include the following:
  - 1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
  - 2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- C. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:



1. "Severe Environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

#### 1.04 SUBMITTALS

- A. Product Data: For each coating system indicated. Include block fillers and primers.
  1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
  1. After color selection, Commissioner will furnish color chips for surfaces to be coated.
- D. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
  1. Provide stepped Samples defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  2. List of material and application for each coat of each sample. Label each sample for location and application.
  3. Submit samples on the following substrates for Commissioner's review of color and texture:
    - a. Ferrous and Nonferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects

with project names and addresses, names and addresses of architects and owners, and other information specified.

#### 1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
  - 1. Commissioner will select one area, or surface to represent surfaces and conditions for application of each type of coating and substrate.
    - a. Fence Surfaces: Provide samples on at least 100 sq. ft. of fence surface.
    - b. Small Areas and Items: Commissioner will designate items or areas required.
    - c. After finishes are accepted, Commissioner will use the surface to evaluate coating systems of a similar nature.
  - 2. Final approval of colors will be from benchmark samples.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
  - 1. Name or title of material
  - 2. Product description (generic classification or binder type)
  - 3. Manufacturer's stock number and date of manufacture
  - 4. Contents by volume, for pigment and vehicle constituents
  - 5. Thinning instructions
  - 6. Application instructions
  - 7. Color name and number
  - 8. Handling instructions and precautions
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

#### 1.07 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
  2. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

#### 1.08 EXTRA MATERIALS

- A. Furnish extra high-performance coating materials from the same production run as materials applied and in quantities described below. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
  1. Quantity: Furnish extra coating materials in quantities indicated below:
    - a. Semigloss, Aliphatic Polyurethane Enamel: 5 gallons of each color applied

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products indicated in the coating system descriptions.
  1. Carboline Company (Carboline)
  2. Rust-Oleum Corporation (R-O)
  3. Tnemec Company, Inc. (Tnemec)
  4. Benjamin Moore & Company (Moore)
  5. Sherwin-Williams Company (S-W)
  6. Modac Products Company, Inc. (Modac)

## 2.02 COATINGS MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 450 g/L or less.

## 2.03 COLORS

- A. Match Commissioner's samples.

## 2.04 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous-metal surfaces:
  - 1. Severe Environment (Semigloss Finish): One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended by manufacturer.
      - (1) Carboline: 893 2-Component Cross-Linked Epoxy
      - (2) Tnemec: Series 27 F. C. Typoxy Polyamide Epoxy
      - (3) Rust-Oleum: Ply Tile 520-W-45
      - (4) International: Intercure 420
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.0 mils.
      - (1) Carboline: 890 2-Component Epoxy
      - (2) Tnemec: Series 66 Hi-Build Epoxoline
      - (3) Rust-Oleum: Ply Tile 520
      - (4) International: Intercure 420

- c. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
  - (1) Carboline: 133-HB 2-Component Aliphatic Polyurethane
  - (2) Tnemec: Series 75 Endura-Shield
  - (3) Rust-Oleum: Ply Thane 890
  - (4) International: Interfine 870
- B. Nonferrous Metal: Provide the following finish systems over exterior nonferrous-metal surfaces:
  - 1. Severe Environment (Semigloss Finish): One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended by manufacturer.
      - (1) Carboline: Rustbond Penetrating Sealer SG
      - (2) Tnemec: Series 27 F. C. Typoxy Polyamide Epoxy
      - (3) Rust-Oleum: Ply Tile 520-W-45
      - (4) International: Intercure 420
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 8.0 mils.
      - (1) Carboline: 890 2-Component Epoxy
      - (2) Tnemec: Intermediate coat not required
      - (3) Rust-Oleum: Ply Tile 520
      - (4) International: Intermediate coat not required
    - c. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
      - (1) Carboline: Carboline 133 HB Aliphatic Polyurethane
      - (2) Tnemec: Series 75 Endura-Shield
      - (3) Rust-Oleum: Ply Thane 890
      - (4) International: Interfine 870
- C. Concrete: Provide the following finish systems over exterior concrete surfaces:
  - 1. Severe Environment (Flat Finish): Two finish coat of self-priming, high build, solvent-acrylic based, waterproof, pigmented sealer/paint.

- a. Finish Coats: Solvent/acrylic coating applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 8.0 mils per coat.

- (1) Modac: Modac F - 019 Line
- (2) Moore: Moorelastic 048
- (3) S-W: Ultra-Crete Solvent Coating A46

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
  1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
  2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
  1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
    - a. Confirmation of primer's suitability for expected service conditions.
    - b. Confirmation of primer's ability to be top coated with materials specified.
  2. Notify Commissioner about anticipated problems before using the coatings specified over substrates primed by others.

#### 3.02 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
  1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

- B. **Cleaning:** Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. **Surface Preparation:** Clean and prepare surfaces to be coated according to manufacturers written instructions for each substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
  2. **Ferrous-Metal Substrates:** Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
    - a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10/NACE No. 2.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
  3. **Nonferrous-Metal Substrates:** Clean nonferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and application required.
    - a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. **Material Preparation:** Carefully mix and prepare coating materials according to manufacturers written instructions.
1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
  2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
  3. Use only the type of thinners approved by manufacturer and only within recommended limits.

- E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

### 3.03 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
  - 1. Use applicators and techniques best suited for the material being applied.
  - 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
  - 3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
  - 4. Provide finish coats compatible with primers used.
  - 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, covers, grilles and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
    - a. Coat surfaces behind movable equipment and removable covers and grilles the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment with prime coat only.
    - b. Coat back side of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
  - 1. The number of coats and film thickness required is the same regardless of application method.
    - a. Omit primer on metal surfaces that have been shop primed and touchup painted.
    - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
    - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.



- d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
  2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
    - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
    - b. Brush out and work brush coats into surfaces in an even film.
    - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
  3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
    - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
    - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
    - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.

1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- F. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

### 3.04 FIELD QUALITY CONTROL

- A. City reserves the right to invoke the following procedure at any time and as often as City deems necessary during the period when coatings are being applied:
  1. City will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will perform appropriate tests for the following characteristics as required by City:
    - a. Quantitative materials analysis
    - b. Absorption
    - c. Accelerated weathering
    - d. Accelerated yellowness
    - e. Color retention
    - f. Alkali and mildew resistance
    - g. Abrasion resistance
    - h. Apparent reflectivity
    - i. Washability
    - j. Dry opacity
    - k. Recoating
    - l. Skinning
  3. City may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. If necessary, Contractor may be required to remove rejected materials from previously coated surfaces if, on recoating with specified materials, the two coatings are not compatible.

### 3.05 CLEANING

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.06 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Commissioner, and leave in an undamaged condition.
  - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
  - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

-END OF SECTION-

**Section 09912**  
**INTERIOR PAINTING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes surface preparation and field painting of exposed and interior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
  - 2. Follow Finish Schedule for floor, wall and ceiling surfaces to receive paint finish.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Commissioner will select from standard colors and finishes available.
  - 1. Painting includes field painting of non-stainless steel stair framing, steel lintels, interior concrete walls, beams, and ceilings, interior concrete block, gypsum wallboard, exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
  - 2. Interior pavement striping
- C. Do not paint fire protected steel, prefinished items, concealed surfaces, finished metal surfaces, finish flooring, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Galvanized steel floor deck
    - b. Galvanized cold formed metal framing
    - c. Stainless steel stairs, floor grating and checkered plate
    - d. Aluminum floor grating and checkered plate
    - e. Acoustical panel ceiling
    - f. Metal toilet enclosures
    - g. Metal urinal screens
    - h. Metal cabinets and personnel lockers

- i. Casework
  - j. Diffusers, Registers, Grilles, Fans, Air Handling Unit, Unit Heaters, Air Cooled Condensating Unit, Radiant Heaters
  - k. Water Heater
  - l. Domestic Water Pumps, Sewage Pumps, Drainage Pumps
  - m. Oil/Water Separators
  - n. Fire Pumps, Jockey Fire Pumps
  - o. Floor Drains, Trench Drains
  - p. Finished Mechanical and Electrical Equipment
  - q. Light fixtures
  - r. Transformers
  - s. Panel Boards
  - t. Motor Control Center
  - u. Switchgears
  - v. Automatic Transfer Switches
  - w. Disconnect Circuit Breakers
  - x. Control Panels
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
- a. Furred areas
  - b. Ceiling plenums
  - c. Utility tunnels
  - d. Pipe spaces
  - e. Duct shafts
3. Finished metal surfaces include the following:
- a. Galvanized steel
  - b. Stainless steel
  - c. Chromium plate
  - d. Copper and copper alloys

- e. Brass
  - f. Pipe Insulation
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators
  - b. Linkages
  - c. Sensing devices
  - d. Motor and fan shafts
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

#### 1.02 RELATED SPECIFICATIONS

- A. Section 05120 Structural Steel for shop priming structural steel.
- B. Section 05500 Metal Fabrications for shop priming ferrous metal.
- C. Section 07811 Sprayed Fire Resistive Materials for fire-protected structural steel coatings.
- D. Section 09260 Gypsum Board Assemblies for surface preparation of gypsum board.
- E. Section 09265 Gypsum Board Shaft Wall for surface preparation of gypsum board.
- F. Section 09010 Room Finish Schedule for typical painting application.
- G. Sections related to Plumbing
- H. Sections related to HVAC
- I. Sections related to Electrical
- J. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

#### 1.03 DEFINITIONS

- A. Standard coating terms defined in ASTM D 16 apply to this Section.
  - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.

4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

#### 1.04 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
  1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
  1. After color selection, Commissioner will furnish color chips for surfaces to be coated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
  1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
  3. Submit 2 Samples on the following substrates for Commissioner's review of color and texture only:
    - a. Concrete: 4-inch- square Samples for each color and finish.
    - b. Concrete Unit Masonry: 4-by-8-inch Samples of masonry, with mortar joint in the center, for each finish and color.
    - c. Ferrous Metal: 3-inch- square Samples of flat metal and 6-inch- long Samples of solid metal for each color and finish.
- D. Qualification Data: For Applicator.

#### 1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project,

whose work has resulted in applications with a record of successful in-service performance.

- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material
2. Product description (generic classification or binder type)
3. Manufacturer's stock number and date of manufacture
4. Contents by volume, for pigment and vehicle constituents
5. Thinning instructions
6. Application instructions
7. Color name and number
8. VOC content

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

#### 1.07 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 degrees F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 degrees F.

#### 1.08 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to City.

1. Quantity: Furnish City with an additional not less than 5 gal. of each material and color applied.



## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Benjamin Moore & Co. (Benjamin Moore)
  - 2. Kelly-Moore Paint Co. (Kelly-Moore)
  - 3. M. A. Bruder & Sons, Inc. (M. A. B. Paint)
  - 4. PPG Industries, Inc. (Pittsburgh Paints)
  - 5. Sherwin-Williams Co. (Sherwin-Williams)

## 2.02 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with to the following chemical restrictions:
  - 1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
  - 2. Restricted Components: Paints and coatings shall not contain any of the following:
    - a. Acrolein
    - b. Acrylonitrile
    - c. Antimony
    - d. Benzene
    - e. Butyl benzyl phthalate

- f. Cadmium
- g. Di (2-ethylhexyl) phthalate
- h. Di-n-butyl phthalate
- i. Di-n-octyl phthalate
- j. 1,2-dichlorobenzene
- k. Diethyl phthalate
- l. Dimethyl phthalate
- m. Ethylbenzene
- n. Formaldehyde
- o. Hexavalent chromium
- p. Isophorone
- q. Lead
- r. Mercury
- s. Methyl ethyl ketone
- t. Methyl isobutyl ketone
- u. Methylene chloride
- v. Naphthalene
- w. Toluene (methylbenzene)
- x. 1,1,1-trichloroethane
- y. Vinyl chloride

D. Colors: As selected by Commissioner from manufacturer's full range.

## 2.03 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated latex block fillers.

- 1. Benjamin Moore; Block Filler No. M 88: Applied at a dry film thickness of not less than 8.0 mils.
- 2. Kelly-Moore; 521 Fill and Prime Acrylic Block Filler: Applied at a dry film thickness of not less than 10.0 to 12.0 mils.
- 3. M. A. B.; Block Filler No. 2000: Applied at a dry film thickness of not less than 12.0 to 15 mils.
- 4. Pittsburgh Paints; Pitt-Glaze No. 60-90 Block Filler: Applied at a dry film thickness of not less than 6.2 to 13.0 mils.
- 5. Sherwin-Williams; PrepRite Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

B. Concrete Unit Masonry Block Filler: Factory-formulated high-performance epoxy block filler.

- 1. Benjamin Moore; Block Filler No. M31/M32: Applied at a dry film thickness of not less than 10.0 mils.

2. Kelly-Moore; Poly-Chem PC 145: Applied at a dry film thickness of not less than 10.0 mils.
3. M. A. B.; Block Filler Ply-Tile No. 161135/761188: Applied at a dry film thickness of not less than 5.0 to 10.0 mils.
4. Pittsburgh; Aquapon Epoxy Block Filler 97-685: Applied at a dry film thickness of not less than 12.0 to 24.0 mils.
5. Sherwin-Williams; Block Filler Kem-Cati HS No. B42W400/B42V401: Applied at a dry film thickness of not less than 10.0 mils.

## 2.04 INTERIOR PRIMERS

### A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils.
3. Kelly-Moore; 971 Acry-Prime Interior Latex Primer/Sealer: Applied at a dry film thickness of not less than 1.6 mils.
4. M. A. B. Paint; Rich Lox Prime Fast 037-138: Applied at a dry film thickness of not less than 1.5 mils.
5. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
6. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils.

### B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
2. Kelly-Moore; 971 Acry-Prime Interior Latex Primer/Sealer: Applied at a dry film thickness of not less than 1.6 mils.
3. M. A. B. Paint; Rich Lux Prime Fast037-138: Applied at a dry film thickness of not less than 1.5 mils.

4. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
  5. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
  2. Kelly-Moore; Chemical Mastic CM-15: Applied at a dry film thickness of not less than 5.0 mils.
  3. M. A. B. Paint; Rust-O-Lastic Anti-Corrosive Primer 073-132: Applied at a dry film thickness of not less than 2.0 mils.
  4. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  5. Sherwin-Williams; Chembond-HS Metal Primer B-50 Series: Applied at a dry film thickness of not less than 2.0 mils.
- D. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils.
  2. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
  3. Kelly-Moore; 1722 Kel-Guard Acrylic Galvanized Iron Primer: Applied at a dry film thickness of not less than 1.8 mils.
  4. M. A. B. Paint; Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189: Applied at a dry film thickness of not less than 2.0 mils.
  5. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  6. Sherwin-Williams; ProCryl Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

## 2.05 INTERIOR FINISH COATS

- A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
  - 1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils.
  - 2. Kelly-Moore; 1610 Sat-N-Sheen Interior Latex Low Sheen Wall and Trim Finish: Applied at a dry film thickness of not less than 1.6 mils.
  - 3. Kelly-Moore; 1686 Dura-Poxy Eggshell Acrylic Enamel: Applied at a dry film thickness of not less than 1.6 mils.
  - 4. M. A. B. Paint; Rich Lux Latex Eggshell Enamel 405 Line: Applied at a dry film thickness of not less than 1.5 mils.
  - 5. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils.
  - 6. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W1200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Epoxy Enamel for Masonry and Concrete: Factory-formulated epoxy interior enamel.
  - 1. Benjamin Moore; Epoxy Enamel No. M45/M46: Applied at a dry film thickness of not less than 3.0 to 5.0 mils.
  - 2. Kelly-Moore; CM15 Hi-Build Epoxy Mastic: Applied at a dry film thickness of not less than 5.0 to 7.0 mils.
  - 3. M. A. B. Paint; Hippopoxy 52 Series: Applied at a dry film thickness of not less than 5.0 to 7.0 mils.
  - 4. Pittsburgh Paints; Aquapon High Build Epoxy 97-130: Applied at a dry film thickness of not less than 4.0 to 6.0 mils.
  - 5. Sherwin-Williams; Epolon Multi-II Series: Applied at a dry film thickness of not less than 4.0 to 5.0 mils.
- C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
  - 1. Benjamin Moore; IronClad Low Lustre Super Spec Latex Semi-Gloss Enamel No. 363: Applied at a dry film thickness of not less than 1.2 mils.

2. Kelly-Moore; 1685 Dura-Poxy Semi-Gloss Acrylic Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  3. M. A. B. Paint; Fresh Kote Latex Semi-Gloss 410 Line: Applied at a dry film thickness of not less than 1.5 mils.
  4. Pittsburgh Paints; Minor Hall Semi-Gloss 87-6 Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mils.
  5. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Series: Applied at a dry film thickness of not less than 1.3 mils.
- D. Interior Pavement Striping: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Benjamin Moore; Safety Zone marking, Latex M58.
  2. Sherwin-Williams; Traffic Marking Paint: Set Fast Acrylic, Latex TM2160

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Commissioner about anticipated problems when using the materials specified over substrates primed by others.

### 3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
  2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
  3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove

pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods check for chromates.

- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
  2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  3. Provide finish coats that are compatible with primers used.
  4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.



8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
  10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces, including material installed under requirements of Specification sections related to Plumbing, HVAC, and Electrical work.
- F. Mechanical items to be painted include, but are not limited to, the following:
  - 1. Uninsulated metal piping
  - 2. Uninsulated plastic piping.
  - 3. Pipe hangers and supports
  - 4. Tanks that do not have factory-applied final finishes
  - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets
  - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
  - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
  - 1. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.

- L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- M. Interior Pavement Striping: Stripe and mark paving that is clean and dry and by method recommended by the manufacturer.
- N. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.04 FIELD QUALITY CONTROL

- A. The City of New York reserves the right to invoke the following test procedure at any time and as often as City deems necessary during the period when paint is being applied:
  - 1. The City of New York will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
  - 2. Testing agency will perform appropriate tests for the following characteristics as required by The City of New York:
    - a. Volume Solids
    - b. Dry Film Thickness
    - c. Type of Resin
    - d. Gloss or Sheen as per ASTM D523
  - 3. The City of New York may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.05 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

### 3.06 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Commissioner.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.07 INTERIOR PAINT SCHEDULE

- A. Concrete: Provide the following paint systems over interior concrete:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer
    - a. Primer: Interior concrete and masonry primer
    - b. Finish Coats: Interior low-luster acrylic enamel
  - 2. Epoxy Enamel Finish: Two finish coats over a primer
    - a. Primer: Interior concrete and masonry primer
    - b. Finish Coats: Interior epoxy enamel
- B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a block filler
    - a. Block Filler: Concrete unit masonry block filler
    - b. Finish Coats: Interior low-luster acrylic enamel
  - 2. Epoxy-Enamel Finish: Two finish coats over a block filler
    - a. Block Filler: Concrete unit masonry block filler
    - b. Finish Coats: Interior epoxy enamel
- C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats finish coats over a primer
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.

- D. Ferrous Metal: Provide the following finish systems over ferrous metal:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer
    - a. Primer: Interior ferrous-metal primer, alkyd based
    - b. Finish Coats: Interior semigloss acrylic enamel
- E. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats finish coats over a primer
    - a. Primer: Interior zinc-coated metal primer
    - b. Finish Coats: Interior semigloss acrylic enamel
- F. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
  - 1. Primer as recommended by manufacturer and finish to match adjacent surface.
  - 2. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coats: Interior flat latex-emulsion

-END OF SECTION-

**Section 09967**  
**COATING FOR STEEL WATERFRONT STRUCTURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Under this Section, the Contractor shall coat steel fender piles, sheet piles, king piles, exterior ladders, trench drain frames and fender frame assemblies.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 - Regulated Materials Control
- B. Section 01356 - Safe and Healthful Working Conditions
- C. Section 01733 - Construction Waste Management
- D. Section 02390 - Fender Piles
- E. Section 02396 - Marine Fendering
- F. Section 02457 - Steel Sheet Piling
- G. Section 15430 - Plumbing Specialties

**1.03 REFERENCES**

- A. The work covered in this Section shall conform to the latest edition and latest addenda thereto of the following publications to the extent referenced. The publications are referred to in the text by the basic designation only.

- 1. American Society for Testing and Materials (ASTM)
  - a. ASTM D4285 Indicating Oil or Water in Compressed Air
  - b. ASTM D4417 Field Measurement of Surface Profile of Blast Cleaned Steel
  - c. ASTM D5162 Discontinuity (Holiday) Testing of Non-conductive Protective Coating on Metallic Substrate
  - d. ASTM D7091 Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
  - e. ASTM E376 Measuring Coating Thickness by Magnetic Field or Eddy Current (Electromagnetic) Examination Methods

2. Society for Protective Coatings<sup>1</sup> (SSPC)
  - a. SSPC AB 1 Mineral and Slag Abrasives
  - b. SSPC PA 1 Shop, Field, and Maintenance Painting of Steel
  - c. SSPC PA-2 Measurement of Dry Coating Thickness with Magnetic Gauges
  - d. SSPC PA Guide 6 Guide for Containing Debris Generated during Paint Removal Operations
  - e. SSPC PS 11.01 Black (or Dark Red) Coal Tar Epoxy-Polyamide Painting System
  - f. SSPC PS 12.01 One-Coat Zinc-Rich Painting System
  - g. SSPC PS 13.01 Epoxy Polyamide Painting System
  - h. SSPC Paint 16 Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint
  - i. SSPC Paint 22 Epoxy Polyamide Paints
  - j. SSPC QP 1 Evaluating Painting Contractors
  - k. SSPC SP 1 Solvent Cleaning
  - l. SSPC SP 10 Near-White Blast Cleaning
  - m. SSPC VIS 1 Visual Standard for Dry Abrasive Blast Cleaned Steel (Standard Reference Photographs)
  - n. SSPC Guide to VIS 1 Guide to Visual Standard for Dry Abrasive Blast Cleaned Steel

#### 1.04 SUBMITTALS

- A. Prior to commencement of the work, the Contractor shall submit to the Commissioner for approval, in accordance with the General Conditions and Section 01330 - Shop Drawings, the following information at least 3 weeks prior to the start of work:
  1. Qualifications: Submit evidence documenting qualifications meeting the requirements of Article 1.05.

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<sup>1</sup> Formerly Steel Structures Painting Council

- a. Identification of coating applicator and documentation of his/her qualifications.
- b. Testing Technicians and Testing Agency: Submit data on qualifications of the Contractor's proposed testing agency and technicians

2. Product Data

- a. Three copies of manufacturer's Material Safety Data Sheets (MSDS) for coatings, solvents and other potentially hazardous materials.
- b. Manufacturer's catalog cuts showing conformance to the requirements herein and recommendations for product application. Submittal shall note if thinners are proposed and shall include information required by paragraph 3.03A.

3. Quality Control Submittals

- a. Test Reports and Records:
  - (1) Submit record of established "surface standard" and record of pre-preparation testing as specified in Article 3.02 entitled "CLEANING AND PREPARATION OF SURFACES".
  - (2) Submit reports by the Contractor's Independent Testing Laboratory as specified in Article 3.06 entitled FIELD QUALITY CONTROL.

1.05 QUALITY ASSURANCE

- A. The Contractor shall conform to all applicable manufacturers' recommendations. Arrange for the coating manufacturer's representative to be present and to furnish applicable supervision and reports at times specified in this Section.
- B. Testing Agency/Laboratory: Engage the services of an independent testing laboratory approved by Commissioner to perform testing of coating samples and abrasive for compliance with specification requirements to be performed by the Contractor. Testing shall be performed by an approved accredited laboratory regularly engaged in testing of paint samples and abrasive.
- C. Coating Applicator Qualifications:
  1. The surface preparer and coating applicator shall be SSPC QP 1 certified while accomplishing any surface preparation or coating application.
    - a. Should the applicator's SSPC certification expire, the firm will not be allowed to perform any work until the certification is re-issued.



Requests for extension of time due to inactive certification will not be considered.

2. For each entity performing coating, submit evidence that the coating applicator has satisfactorily applied coating at structures similar in size, nature and complexity as the proposed work and has a minimum of 3 years of documented experience in their respective fields. Indicate the names and locations of the structure, type and design of the equipment used and the applicator's facilities.
3. Pre-application Meeting: Convene a pre-application meeting at least 2 weeks before start of application of coating systems on fabricated/constructed items of the Project. Require attendance of parties directly affecting work of this Section, including the Contractor, fabricator, the Commissioner, applicator, and coating manufacturer's representative. Review the following:
  - a. Environmental requirements
  - b. Protection of surfaces not scheduled to be coated
  - c. Surface preparation
  - d. Application, including review of field samples/mock-ups
  - e. Repair
  - f. Field quality control
  - g. Cleaning
  - h. Protection of coating systems
  - i. One-year inspection
  - j. Coordination with other work

#### 1.06 ENVIRONMENTAL CONDITIONS

- A. Start coating work only when ambient and curing temperatures and relative humidity are within limits of coating manufacturer's recommendations and the surface temperature of the steel is at least 5° F. above dew point temperature.
- B. Apply coatings only be when the steel surfaces are perfectly dry. Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
- C. Do not spray coatings if wind velocity is above manufacturer's limit.
- D. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.
- E. Dust and Contaminants
  1. Schedule coating work to avoid excessive dust and airborne contaminants.
  2. Protect work areas and surfaces from excessive dust and airborne contaminants during coating application and curing.

## 1.07 SAFETY AND HEALTH PRECAUTIONS

- A. Materials listed in this section contain ingredients which are toxic. Follow safety procedures as recommended by manufacturer MSDS. Work in a well ventilated area. Provide, and require workers to use, impervious clothing, gloves, face shields (8 inch minimum), and other appropriate protective clothing necessary to prevent eye and skin contact with coating materials. Keep coatings away from heat, sparks and flame.

## 1.08 MATERIALS HANDLING AND STORAGE

- A. Handling, storage and disposal of coating shall strictly conform to the manufacturer's recommendations, Section 01355, and Section 01733. A list of minimum handling and storage requirements follows.
- B. All liquid epoxy components to be used in the work shall be delivered to the jobsite in tightly sealed unopened containers, clearly labeled to indicate:
  - 1. Name of manufacturer
  - 2. Manufacturer's product name and component designation
  - 3. Manufacturer's lot number and "Use before" date
  - 4. ANSI (American National Standards Institute) hazardous material rating and handling precautions
- C. Epoxy liquid epoxy components shall be stored in a covered, well ventilated space. The storage temperature of the liquid components shall not exceed 90° F nor be less than 40° F at any time after receipt by the Contractor, unless otherwise specified by the manufacturer.
- D. Containers containing liquid epoxy components shall always be sealed and air tight from time of receipt by contractor until entering the proportioning and blending process. When containers are opened for sampling or other purposes and containers remain partially filled, their lids will be tightly closed to prevent contamination by moisture or other substances. After the seal has been broken on a container, its contents must be used within seven (7) days or removed from the project, unless the manufacturer has more stringent requirements.
- E. All project personnel handling coatings shall be properly alerted to the Epoxy Safety Requirements supplied by the manufacturer. MSDSs shall be supplied with each shipment of liquid epoxy materials. Copies thereof shall be distributed to project personnel and the requisite copies as required by Paragraph 1.04A.2.a shall be submitted to the Commissioner.

**1.09 REGULATORY REQUIREMENTS**

- A. Lead Content: Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.
- B. Chromate Content: Do not use coatings containing zinc-chromate or strontium-chromate.
- C. Asbestos Content: Materials shall not contain asbestos.

**1.10 WARRANTY PROVISIONS**

- A. The Commissioner will set a meeting date for an on-site inspection of coating systems within a month prior to expiration of the Project guaranty period specified in Section 01781.
- B. The Contractor, the Contractor's coating applicator, the Commissioner, and coating manufacturer's representative shall attend the scheduled coating inspection meeting.
- C. The Contractor shall repair deficiencies in coating systems as determined by the Commissioner's observation in accordance with manufacturer's instructions as approved by the Commissioner. Repair of coating deficiencies by the Contractor shall be completed prior to the City of New York's acceptance of the Contractor's Contract obligations.

**PART 2 PRODUCTS****2.01 COATING SYSTEMS**

- A. Finish coating for steel fender piles and sheet piles shall be a Coal Tar Epoxy-Polyamide system conforming to:
  - 1. System: SSPC PS 11.01
  - 2. Paints: SSPC Paint 16
  - 3. Color shall be as specified in Paragraph 3.04F
- B. Finish coating for fender panels and exterior ladders shall be an
  - 1. An Epoxy-Polyamide system conforming to:
    - a. System: SSPC PS 13.01
    - b. Paints: SSPC Paint 22
    - c. Color: Black
  - 2. Ladder Rungs shall additionally be coated with an ablative anti-fouling coating such as C-Flex 1-2-3 by Carboline Co. or approved equal. Color shall be red.

## C. Finish Coating for Trench Drain Frames

1. Furnish an elastomeric urethane coating system with a tan color. Acceptable products include the following or approved equal:

- a. Polibrid 705-E by International Protective Coatings
- b. Polibrid 705 by Carboline
- c. Sherflex by Sherwin Williams

- D. Provide catalyst components for coatings specific for resin components provided. When allowed by coating manufacturer, use thinners compatible with the coating.

## 2.02 SOLUBLE SALTS TEST KITS

- A. Test Kit for Measuring Chlorides on Steel Surfaces: Provide test kits such as CHLOR\*TEST, as manufactured by CHLOR\*RID International Inc. of Chandler, Arizona ([www.chlor-rid.com](http://www.chlor-rid.com)) or approved equal meeting the following requirements:

1. Kit contains all materials, supplies, tools and instructions for field testing and on site quantitative evaluation;
2. Kit extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;
3. Kit components and solutions are mercury free and environmentally friendly;
4. Kit contains a factory sealed titration device;
5. Kit contains new materials and solutions for each test;
6. Test container (vessel, sleeve, cell. etc.) creates a sealed, encapsulated environment during chloride ion extraction;
7. Test container is suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough;
8. Kit uses test container, with resulting chloride ion extract solution, as the titration container;
9. Chloride ion concentration is directly measured in micrograms per square centimeter without using either conversion charts or tables.

## 2.03 ABRASIVE

- A. The referenced abrasive specifications have maximum limits for soluble salts contamination; however, this maximum level of contamination does not guarantee

that contamination will not be transferred to the steel surface during abrasive blasting. Other factors such as on site handling and recycling can allow contamination of abrasive. The Contractor is cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of chlorides in abrasive does not negate the final acceptance testing of steel surfaces.

- B. Non-metallic Abrasive: Conform to SSPC AB 1, Type I or II, Class A. Make adjustments to processes or abrasive gradation to achieve specified surface profile. Recycled non-metallic abrasive shall meet all requirements of the specification each time that it is placed in the blast pot.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Protection of Area and Spaces: Prior to surface preparation and coating applications, remove, mask, or otherwise protect surfaces adjacent to the work. Design and provide a containment system for the capture, containment, collection, storage and disposal of the waste materials generated by the work under this Section, to meet the requirements of SSPC PA Guide 6, Class 4. Waste materials covered by this paragraph shall not include any material or residue from removal of coatings containing lead, chromium, cadmium, PCB, or any other hazardous material. It is the Contractor's responsibility to insure the feasibility and workability of the containment system. The Contractor shall perform its operations and work schedule in a manner as to minimize leakage of the containment system. Properly maintain the containment system. If at any time during the execution of the work, the containment system fails to function satisfactory, suspend all operations, except those required to minimize adverse impact on the environment or property. Do not resume operations until modifications have been made to correct the cause of the failure.

### 3.02 CLEANING AND PREPARATION OF SURFACES

- A. General: Sequence surface cleaning and preparation as follows:
  - 1. Solvent Clean Surfaces
  - 2. Establish Surface Standard for blast cleaning
  - 3. Perform Pre-preparation Testing for Surface Contamination"
  - 4. Blast Clean Surfaces
  - 5. Test for Surface Contamination and Cleanliness
- B. Accomplish surface preparation as directed and as specified by the cited SSPC references. All surfaces prepared for coating shall be to the satisfaction and approval of the Commissioner and the Coating Manufacturer's representative.

- C. Solvent Cleaning: Conform to SSPC SP 1. Remove visible oil, grease, and drawing and cutting compounds by solvent cleaning.
- D. Surface Standard: Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use in establishing a surface standard. Blast clean one or more 1-foot square steel panels as specified herein. Include sequenced testing for surface contamination.
  - 1. Record blast nozzle type and size, air pressure at nozzle and compressor, distance of nozzle from panel, and angle of blast to establish procedures for blast cleaning.
  - 2. Measure surface profile in accordance with ASTM D4417. When the surface standard complies with all specified requirements, seal with a clearcoat protectant.
  - 3. Use the surface standard for comparison to abrasive blasted surfaces throughout the course of work.
- E. Pre-Preparation Testing for Surface Contamination: Comply with testing sequence specified for surface cleaning and preparation.
  - 1. Pre-Preparation Testing for Oil and Grease Contamination:
    - a. Inspect all surfaces for oil and/or grease contamination using two or more of the following inspection techniques:
      - (1) Visual inspection
      - (2) Water Break Test: Spray atomized mist of distilled water onto surface, and observe for water beading. If water "wets" surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of water (water forms droplets) is evidence of oil or grease contamination.
      - (3) Cloth Rub Test: Rub a clean, white, lint free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.
    - b. Reject oil and/or grease contaminated surfaces, clean using water based pH neutral degreaser in accordance with SSPC SP 1, and recheck for contamination until surfaces are free of oil and grease.
  - 2. Pre-Preparation Testing for Soluble Salts Contamination:

- a. Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. Soluble salt testing is also required in Paragraph 3.02G.2 as a final acceptance test of prepared surfaces after abrasive blasting, and successful completion of this test does not negate that requirement. This phase is required since pre preparation washing is generally more effective than attempting to remove soluble salt contamination after abrasive blasting.
  - b. Effective removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water washing and soluble salts remover.
  - c. The soluble salts remover shall be acidic, biodegradable, nontoxic, non-corrosive, and after application, shall not interfere with adhesion of the first coat. Delays between testing and preparation, or testing and coating application may allow for the formation of new contamination.
  - d. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting.
  - e. Test methods and equipment used in this phase are selected at the Contractor's discretion.
- F. Blast Cleaning: Conform to SSPC SP 10. After solvent cleaning, complete surface preparation by near-white blast cleaning. Remove residual dust from blasted surface by blowing with dry, oil-free air, vacuuming, or sweeping. For trench drain frame, provide angular surface profile of at least 4 mils, but no greater than 4-1/2 mils. For other items, provide angular surface profile of at least 2-1/2 mils, but no greater than 3 mils. Prepared surfaces shall conform to SSPC VIS 1 and SSPC Guide to VIS 1 and shall match the previously prepared and established "surface standard" test panels. Abrasive shall be a mineral grit meeting the requirements of Article 2.03.
1. Abrasive Blasting Equipment: Use abrasive blasting equipment of conventional air, force feed, or pressure type. Maintain a minimum pressure of 95 psig at nozzle. Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with ASTM D4285. Test air quality at each startup, but in no case less often than every five operating hours.
  2. Provide the mil surface profile specified herein. Reject profile greater than maximum specified, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with ASTM D4417.
    - a. Measure profile at rate of:

- (1) Sheet Piles (AZ Shapes): Three (3) tests for the first 1,000 square feet prepared plus one test for each additional 1,000 square feet or part thereof.
  - (2) Fender Piles (HP shapes) and King Piles (HZ Shapes): One test each for the first three (3) piles prepared, one test per each additional three (3) piles.
  - (3) Fender Panels: Three (3) tests for first panel prepared, one test for each additional panel.
  - (4) Exterior Ladders: Three (3) tests for first ladder prepared, one test for each additional ladder.
  - (5) Trench Drain Frames: One test for each 25' length of trench.
- b. Provide two (2) additional measurements for each non-compliant measurement. When surfaces are re-blasted for any reason, retest profile as specified.
  - c. If Method C of ASTM D4417 is used to measure profile, attach test tapes to Daily Inspection Reports.
  - d. Following abrasive blasting, remove dust and debris by brushing, blowing with oil free and moisture free compressed air, or vacuum cleaning. Time interval between abrasive blasting and application of first coat shall not exceed eight (8) hours.
3. Disposal of Used Abrasive: Legally dispose of used abrasive in accordance with local mandated regulations.
- G. Pre-Application Testing for Surface Contamination: Comply with testing sequence specified for surface cleaning and preparation. Perform pre-application testing for surface contamination after abrasive blasting.
1. Pre-Application Testing for Oil and Grease Contamination: Ensure surfaces are free of contamination as described in paragraph 3.02E.1 entitled "Pre-Preparation Testing for Oil and Grease Contamination:", except that only questionable areas need be checked for beading of water misted onto surface.
  2. Pre-Application Testing for Soluble Salts Contamination: Test steel surfaces for chloride contamination using the Test Kit described in Article 2.02.
    - a. Test surfaces at rate of:



- (1) Sheet Piles (AZ Shapes): Three (3) tests for the first 1,000 square feet prepared plus one test for each additional 2,000 square feet or part thereof.
  - (2) Fender Piles (HP shapes) and King Piles (HZ Shapes): One test each for the first three piles prepared, one test per each additional five (5) piles.
  - (3) Fender Panels: Three (3) tests for first panel prepared, one test for each additional panel.
  - (4) Exterior Ladders: Three (3) tests for first ladder prepared, one test for each additional ladder.
  - (5) Trench Drain Frames: Two (2) tests for frame on each side of trench.
- b. One or more readings greater than 5 micrograms of chlorides per square centimeter are evidence of chloride contamination. Reject contaminated surfaces, wash as specified in Paragraph 3.02E.2, allow surfaces to dry, and re test until all required tests show allowable results. Re-blast tested and cleaned areas as required.
- c. Label all test tubes and retain for test verification.
3. Pre-Application Testing for Surface Cleanliness: Apply coatings to dust free surfaces. To test for dust free surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminant.
- a. Test surfaces at rate of:
- (1) Sheet Piles: Three (3) tests for the first 1000 square feet plus one test for each additional 1000 square feet or part thereof.
  - (2) Piles: One test each for the first three (3) piles prepared, one test per each additional three (3) piles.
  - (3) Fender Panels: Three (3) tests for first panel prepared, one test for each additional panel.
  - (4) Exterior Ladders: Three (3) tests for first ladder prepared, one test for each additional ladder.
  - (5) Trench Drain Frames: Two (2) tests for frame on each side of trench.

- b. Reject contaminated surfaces and retest. Provide two (2) additional tests for each failed test or questionable test.
- c. Attach test tapes to Daily Inspection Reports.

### 3.03 PROPORTIONING AND MIXING OF COATING SYSTEMS

- A. Proportioning and mixing of coatings shall be in full conformance with recommendations of coating manufacturer. Reduce coatings to proper consistency by adding fresh coating, except when thinning is mandatory for the type of coating being used in accordance with the manufacturer's instructions. Obtain written permission from the Commissioner to use thinners. In the submittal for written permission, include description of application and quantities and types of thinners to be used. Do not use mixed coatings beyond pot life limits. Keep containers closed when not in use to avoid contamination.
- B. Proportioning of Coal Tar Epoxy-Polyamide System: Coal tar epoxy-polyamide consists of a two-component system. Component A contains a refined coal tar pitch, polyamide resin, and a polyamine promoter to accelerate curing rate. Component B is an epoxy resin. Mix both components in a ratio specified by manufacturer. Do not thin coatings when doing so will result in total volatile organic compounds exceeding limits enacted by local air pollution control districts. Thin materials in accordance with manufacturer's recommendations when thinning is allowed by manufacturer and is approved by the Commissioner.
- C. Proportioning of Epoxy-Polyamide System: Epoxy-polyamide coatings consist of a two-component system that includes a pigmented polyamide resin, Component A and an epoxy resin, Component B. Mix both components in a ratio of 1 to 1 by volume, unless otherwise directed by the manufacturer. Do not thin coatings when doing so will result in total volatile organic compounds exceeding limits enacted by local air pollution control district. When thinning is allowed and is necessary, such as during cold temperature application or to improve application characteristics, add no more than one pint of ethylene glycol monoethyl (EGM) ether for each gallon of the coating unless otherwise directed by the manufacturer.
- D. Mixing of Paint Systems: Power stir components to a smooth, uniform consistency. Stir coating periodically during induction period. Follow coating manufacturer's requirements for induction time and pot life of mixed batches.

### 3.04 COATING APPLICATION

- A. General: Apply first coat to dry surfaces not more than 4 hours after near-white blast cleaning and/or before any signs of flash rusting or visual contamination. Apply coatings with approved brushes, approved rollers, or approved spray equipment, unless specified or recommended otherwise. Spray areas inaccessible to brushing. Apply coats of each system so that finished surfaces are free from runs, sags, brush marks, drops, ridges, waves, laps, and variations in color. Stripe paint

with brush critical locations on steel such as welds, corners, and edges using specified coatings.

- B. Apply coating materials in accordance with SSPC PA 1 and manufacturer's instructions. SSPC PA 1 methods are applicable to all substrates, except as modified herein. The colors of immediately adjacent coats must be different. Thoroughly work coating materials into joints, crevices, and open spaces. Touch up damaged coatings before applying subsequent coats. Uniformly apply coatings at spreading rate required to achieve specified dry film thicknesses.
- C. Determine dry film thickness using a magnetic gage. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- D. First and Intermediate Coats: Do not allow first or intermediate coats to dry more than 30 days, or longer than recommended by the manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if first or intermediate coat is allowed to dry longer than recommended by manufacturer of coating. Each successive coat shall cover the surface of the preceding coat or surface completely and there shall be a visually perceptible difference in shades of successive coats.
- E. Dry Film Thickness: Measure using a magnetic gage. Measurement shall be conducted in accordance with SSPC PA-2.
- F. Coating Systems
  - 1. Coal Tar Epoxy-Polyamide System: Apply two coats, each coat at a dry film thickness of not less than 8 mils. The first coat shall be red and the second coat shall be black. Application of a single black coat at a minimum dry film thickness of 16 mils (0.40 mm) is acceptable. Unless otherwise specified by manufacturer's recommendations, do not allow drying time between coats to exceed 24 hours. Under conditions of direct sunlight or elevated ambient temperatures of 90° F. or greater, limit intercoat drying period to a maximum of 6 hours unless otherwise specified by manufacturer's recommendations.
  - 2. Epoxy-Polyamide System: Apply three coats, each coat at a dry film thickness of between 3 mils and 4 mils. Unless otherwise specified by manufacturer's recommendations, allow previous coat to dry to tack-free condition but not more than 72 hours before applying next coat. If more than 72 hours elapses between coats, clean surface, apply a 2 mil wet film thickness of previous coat, allow to cure to a tacky film, and apply a full thickness of next coat.
  - 3. Ablative Anti-fouling Coating: Apply two coats at a dry film thickness of 3 to 4 mils over epoxy polyamide in accordance with manufacturer's recommendations.

4. Elastomeric Urethane Coating: Coat rear surfaces to be embedded in concrete to a dry film thickness of 30 to 40 mils. Coat exposed surfaces to a dry film thickness of 60 to 80 mils, extending this thickness of coating around the top and bottom edges by ½" onto the rear surfaces to be embedded in concrete.
  - G. Drying Time: Allow time between coats as recommended by the coating manufacturer for the temperature range encountered. Provide each coat in specified condition to receive the next coat.
  - H. Repair of Defects: Repair detected coating holidays, thin areas, and exposed areas damaged prior to or during installation by surface treatment and application of additional coating or by manufacturer's recommendations.
    1. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up would result in a visibly different appearance, either in sheen, texture, or color.
    2. Where welding or fastenings are to be accomplished during installation of steel, field applied protective coats shall be made after completion of connections.
  - I. Complete shop applied coating system shall be allowed to cure for a minimum of eight (8) days prior to installation of the coated steel.
- 3.05 SURFACES TO BE COATED
- A. Coat steel fender piles from the cut-off elevation to a minimum of 15 feet below the proposed dredge depth or mudline, whichever is deeper.
  - B. Coat exposed face of steel sheet and king piles from butt to a minimum of 10 feet below the dredge depth on front side and the existing mudline on the back side.
  - C. Coat all exposed steel surfaces of fender panels and ladders after completion of steel fabrication, including surfaces to receive timber contact panels.
  - D. Coat exposed and embedded surfaces of trench drain frames, including shear studs.
  - E. Concrete-filled steel pipe piles installed in on-shore applications to support land-based structures shall not be coated.

3.06 FIELD QUALITY CONTROL

- A. Inspection and Testing as specified herein shall be performed by the Contractor's Testing Laboratory. Any test not meeting the requirements specified shall be re-performed at the Contractor's expense. Should any test yield results not meet the requirements of these specifications, the Contractor shall re-coat deficient elements

and perform additional testing directed by the Commissioner at no additional cost to the City of New York.

- B. Conduct testing in presence of the Commissioner or his representative.
- C. Tests: Inspection and testing agency shall be responsible for quality control checking, including visual inspection and coating thickness measurements. Inspection and Testing Agency shall keep and submit records of the results of all testing and inspections in a form suitable to the Commissioner including:
  - 1. Holiday Testing: Prior to installation, test for holidays in total coating system in conformance with ASTM D5162. Use a low voltage holiday detector of less than 90 volts in accordance with manufacturer's instructions. Retest, after repair of holidays by surface treatment and application of additional coating or by manufacturer's recommendation.
  - 2. Dry Film Thickness: After repair of holidays, measure dry film thickness in accordance with SSPC PA-2 using a magnetic dry film thickness gage in accordance with ASTM D7091 and ASTM E376. Verify that the dry film thickness of each coat and total dry film thickness of each coating system are as specified using dry film gauges. Re-measure after an additional coat is applied, and add it to meet minimum thickness requirements.
- D. Perform tests in conformance with all applicable standards with the coating manufacturer, with the Contractor and the Commissioner's representative present.
  - 1. Select elements to be tested as directed by the Commissioner's representative.
  - 2. Verify that coatings and other materials are as specified.
  - 3. Verify that surface preparation and application are as specified.
- E. Report
  - 1. Submit written reports describing inspections made and actions taken to correct nonconforming work.
  - 2. Report nonconforming work not corrected.
  - 3. Submit copies of report to the Contractor and the Commissioner.
- F. Manufacturer's Field Services: Coating manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems. The manufacturer's representative shall be present during the first day of surface preparation and application of first coat.

-END OF SECTION-

**Section 10125**  
**BULLETIN BOARDS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tackable bulletin boards.

**1.02 RELATED SPECIFICATIONS**

- A. Section 04201 "Masonry"

**1.03 DEFINITIONS**

- A. Bulletin Board: Tackable surface

**1.04 REFERENCE STANDARDS**

- A. ASTM 84 Standards Test Method for Surface Burning Characteristics for Building Materials.
- B. ASTM B221 Standard Specifications for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

**1.05 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for bulletin boards and display cases.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show location of tack assembly seams and joints.
  - 2. Include sections of typical trim members.
- C. Samples for Initial Selection: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture.
  - 1. Actual sections of tack assembly.
  - 2. Fabric swatches of vinyl and polyester-fabric-faced tack assemblies.
  - 3. Section of header panel for color selection.
- D. Samples for Verification: For each type of product indicated as follows:
  - 1. Tack Assembly: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.

2. Trim: 6-inch- long sections of each trim profile including corner section.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for surface-burning characteristics of vinyl and polyester fabrics.

F. Manufacturer's instructions: Provide manufacturer's installation instruction.

#### 1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of bulletin boards are based on the specific system indicated.

1. Do not modify intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If modifications are proposed, submit comprehensive explanatory data to Commissioner for review.

B. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

C. Operation and Maintenance: Include data on regular cleaning, stain removal and precautions.

#### 1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened, undamaged containers with identification labels intact.

B. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

#### 1.08 PROJECT CONDITIONS

A. Field Measurements: Verify recessed openings by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Comply with manufacturer's recommendation for climatizing area for interior moisture and temperature to approximate normal occupied condition.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

A. Hardboard: AHA A135.4, tempered.

B. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.

- C. Plastic-Impregnated Cork Sheet: MS MIL-C-15116-C, Type I, seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto burlap backing; with washable vinyl finish and integral color throughout.
- D. Vinyl Fabric: FS CCC-W-408, Type II, burlap weave; weighing not less than 13 oz./sq. yd.; with flame-spread index of 25 or less when tested according to ASTM E 84.
- E. Extruded Aluminum Bars and Shapes: ASTM B221, Alloy 6063
- F. Fasteners: Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

## 2.02 TACK ASSEMBLIES

- A. Vinyl-Fabric-Faced Tack Assembly: 1/4-inch- thick, vinyl-fabric-faced cork sheet factory laminated to 1/4-inch- thick hardboard backing.
- B. Panel Size: 3 ft high by 4 ft wide.
- C. Panel Color: Commissioner to select a color from the manufacturer's standard color chart.
- D. Edge Trim: Factory-built extruded aluminum trim. Finish: Satin anodize

## 2.03 WALL-MOUNTED BULLETIN BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. APCO Graphics, Inc.
  - 2. Bass Bulletin and Directory Board Co.; Div. of Bass Industries Inc.
  - 3. Claridge Products & Equipment, Inc.
  - 4. Marsh Industries, Inc.
  - 5. Nelson-Harkins Industries

## 2.04 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in



appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- D. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of work.
- B. Examine walls and partitions for proper backing for bulletin boards.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. General: Install units in locations, indicated on Drawings. Keep perimeter lines straight, plumb, and level. Install units so top edge is 7 feet above finish floor.
- B. Bulletin Boards: Attach units to wall surface with manufacturer's standard concealed hardware.

#### 3.03 ADJUSTING AND CLEANING

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations.

-END OF SECTION-

**Section 10155**  
**TOILET COMPARTMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes solid phenolic core toilet partitions, hardware and accessories as follows:
  - 1. Toilet Enclosures: Ceiling anchored.
  - 2. Entrance Screens: Ceiling anchored.
  - 3. Urinal Screens: Wall hung.
  - 4. Shower partition door: Wall hung.
  - 5. Shower partition divider: Wall hung.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05500 "Metal Fabrications" - supports for ceiling-anchored units to overhead structural system.
- B. Section 10801 "Toilet and Bath Accessories"

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Manufacturer's catalog cuts of typical panel, pilaster, door, hardware and fastenings.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of reinforcements for compartment-mounted grab bars.
- C. Samples for Initial Selection: For each type of unit indicated.
- D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch square Samples of same thickness and material indicated for Work.

**1.04 QUALITY ASSURANCE**

- A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."

**1.05 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

## PART 2 PRODUCTS

## 2.01 SOLID PHENOLIC CORE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bradley Corporation; Mills Partitions
  2. Comtec Industries
  3. General Partitions Mfg. Corp.
  4. Metpar Corp.
  5. Santana Products, Inc.
  6. Weis-Robart Partitions, Inc.
- B. Door, Panel, and Pilaster Construction: Solid, phenolic core with a high pressure decorative matte surface finish as an integral part of the core material. Door and panel edges shall be machined and finished smooth with a beveled edge. Pilasters shall be attached to the ceiling using a lead anchor and fastened to provide vertical and horizontal adjustment.
1. Color and Pattern: One color and pattern in each room as selected by Commissioner from manufacturer's full range of colors and patterns.
- C. Pilaster Sleeves (Caps): Manufacturer's standard design; stainless steel shall be secured by head fasteners.
- D. Hardware: Cast stainless steel with satin brushed finish hardware and stainless steel one way fasteners necessary to complete an installation shall be provided.
1. Hinges shall be wraparound and thru-bolted to the pilasters with gravity cams.
  2. Surface-mounted slide latch shall provide emergency egress and shall be ADA compliant.
  3. Strike and Keeper shall be thru-bolted.
  4. Stirrup Type: Ear or U-bracket shall be stainless steel.
  5. Fasteners for hinges, slide latch and keeper shall be stainless steel with one way heads.
  6. Coat hooks and wall bumpers shall be provided for in-swing doors. Door pulls shall be added for out-swing doors.
- E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

## 2.02 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
  - 1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

## 2.03 FABRICATION

- A. Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with leveling adjustment. Provide sleeves (caps) at pilasters to conceal anchorage.
- B. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.
  - 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
  - 2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
  - 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
  - 4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance screen doors.
  - 5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch
    - b. Panels and Walls: 1 inch
  - 2. Stirrup Brackets: Secure panels to walls and to pilasters with not less than three brackets attached at midpoint and near top and bottom of panel.
    - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- C. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

### 3.02 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

-END OF SECTION-

**Section 10200**  
**LOUVERS AND SCREENS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
  - 1. Fixed, extruded-aluminum louvers
  - 2. Fixed, formed galvanized steel louvers

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 - Plant-Precast Architectural Concrete
- B. Section 05120 - Structural Steel
- C. Section 05400 - Cold Formed Metal Framing
- D. Section 05500 - Metal Fabrications
- E. Section 07920 - Exterior Joint Sealants
- F. Sections related to HVAC Work
- G. Transformer Building: Within this structure, Consolidated Edison Co. specifications and drawings take precedence over other contract documents.

**1.03 DEFINITIONS**

- A. Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide louvers and screens capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of metal components, noise or metal fatigue caused by component rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of each assembly.
  - 1. Wind Loads: 40 psf
- B. Seismic Performance: Provide louvers and screens capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

- C. Seismic Design Criteria: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" unless otherwise required by applicable code requirements.
- D. Thermal Movements: Provide louvers and screens that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

#### 1.05 SUBMITTALS

- A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers, sun screens and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show each component of each assembly; including rafters, blade profiles, angles, and spacing.
  - 1. For installed assemblies indicated to comply with design loads, include structural analysis data/calculations signed and sealed by a Structural Engineer responsible for their preparation, and licensed in New York.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of metal finish required.
- E. Qualification Data: For professional engineer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

#### 1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and screens through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

1. Source shall have not less than three (3) years successful experience in the design and manufacturing of work similar to the assemblies indicated on the Drawings, and as required for this Project.
- B. Welding: Qualify procedures and personnel according to the following:
  1. AWS D1.2, "Structural Welding Code--Aluminum"
  2. AWS D1.3, "Structural Welding Code--Sheet Steel"
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify louver openings, and other materials/systems which support, anchor and interface with the assemblies specified herein by field measurements before fabrication and indicate measurements on Shop Drawings.

#### 1.08 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace louver and screen assemblies that show evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  1. Construction Specialties, Inc.
  2. Airolite
  3. Or approved equal



## 2.02 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5.
- B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Galvanized Steel Sheet: ASTM A 653, G90 zinc coating, mill phosphatized.
- D. Fasteners: Provide fasteners of the types required for each specific application; fasteners shall be of 316 Series stainless steel. Do not use metals that are incompatible with joined materials.
  - 1. Use types and sizes to suit unit installation conditions.
  - 2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.
- E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.03 FABRICATION, GENERAL

- A. General: Assemble louvers and screens in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver and screen assemblies exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
  - 1. Continuous Assemblies: Fabricate units without interrupting blade/fin-spacing pattern unless horizontal mullions are indicated.
  - 2. Horizontal Members: Provide horizontal members at joints where indicated.
- C. Maintain equal component spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Maintain equal component spacing of each louver and sunscreen assembly to produce uniform appearance; unless otherwise indicated on the approved Shop Drawings.

- E. Fabricate frames, sills, rafters, and other supports to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
    - 1. Louver Frame Type: Channel, unless otherwise indicated.
  - F. Include supports, anchorages, and accessories required for complete assembly. Where assemblies are indicated to comply with structural performance requirements, ensure such assemblies are fabricated and installed in accordance with the approved Shop Drawings.
  - G. Provide exposed vertical louver mullions for drainable blade louvers only of type and at spacings indicated.
    - 1. Exterior Corners: Prefabricated corner units with mitered and welded blades and with corner mullion configurations as indicated on the approved Shop Drawings.
  - H. Where indicated, provide subsills made of same material as louvers for recessed louvers.
  - I. Join frame and support members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of each different assembly; make bolted connections between frame members only where indicated on the approved Shop Drawings.
    - 1. Where the size of each louver and sunscreen assembly makes welded construction/connections impossible, provide bolted connections between members with concealed threaded fasteners (or a combination of concealed mechanical fasteners and welds. Such conditions are subject to the Commissioner's acceptance.
- 2.04 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Louver Type 1 - Horizontal Drainable Blade, Aluminum Louvers:

- 1. Selected Products:
  - a. Airolite K6774
  - b. Construction Specialties, Inc. A4097
- 2. Louver Depth: 4 inches, unless otherwise indicated.
- 3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.

4. Performance Requirements:
    - a. Free Area: Not less than 50% for 48-inch- wide by 48-inch- high louver.
    - b. Air Performance: Not more than 0.29 inches wg static pressure drop 1250 FPM free-area velocity.
  5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- B. Louver Type 2 - Horizontal Storm Resistant Aluminum Louvers:
1. Selected Products
    - a. Airolite SCC875
    - b. Acceptable equal
  2. Louver Depth: 8.25 inches, unless otherwise indicated.
  3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.
  4. Performance Requirements
    - a. Free Area: Not less than 50% for 48-inch- wide by 48-inch- high louver
    - b. Air Performance: Not more than 0.30 inches wg static pressure drop at 1250 FPM free-area velocity
    - c. Wind Driven Rain Water Penetration Test Results: Class B or better
  5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- C. Louver Type 3 - Horizontal Straight Blade Aluminum Louvers:
1. Selected Products
    - a. Airolite K609
  2. Louver Depth of Straight Blade: 4 inches, unless otherwise indicated.
  3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.
  4. Performance Requirements
    - a. Free Area: Not less than 47.6% for the 48-inch-wide by 48-inch-high louver

- b. Air Performance: Not more than 0.33 inches wg static pressure drop at 1250 FPM free-area velocity
  - c. Wind Driven Rain Water Penetration Test Results: Class B, or better.
- D. Louver Type 4 – Fixed, Formed Horizontal Drainable Steel Louvers:
  - 1. Selected Products
    - a. Airolite 6774
    - b. Construction Specialties, Inc. GS-407
  - 2. Louver Depth: 4 inches, unless otherwise indicated.
  - 3. Frame and Blade Material and Nominal Thickness: Galvanized steel sheet, of thickness required to comply with structural performance requirements, but not less than 0.063 inch for frames and blades.
  - 4. Mullion Type: Exposed, unless otherwise indicated.
  - 5. Performance Requirements
    - a. Free Area: Not less than 50% for 48-inch- wide by 48-inch- high louver.
    - b. Air Performance: Not more than 0.13 inches H<sub>2</sub>O static pressure drop at 0.01oz./ft<sup>2</sup> free-area velocity.
  - 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.05 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
  - 1. Screen Location for Fixed Louvers: Interior face.
  - 2. Screening Type: Bird screening.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
  - 2. Finish: Same finish as louver frames to which louver screens are attached.
  - 3. Type: Non-rewirable, U-shaped frames for permanently securing screen mesh.

- D. Louver Bird Screening: Stainless steel, 1/2-inch- square mesh, 0.047-inch wire.

## 2.06 LOUVER BLANK-OFF PANELS

- A. Uninsulated, Blank-off Panels: Provide where blank-off is required and where no duct or plenum is attached to louver.
1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness, unless otherwise indicated.
  2. Galvanized steel sheet for steel louvers, not less 0.052-inch nominal thickness, unless otherwise indicated.
  3. Panel Finish: Same type of finish applied to louvers, but black color.
  4. Attach blank-off panels to back of louver frames with stainless-steel, sheet metal screws.
- B. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets. Provide where blank-off is required and where duct or plenum is attached to louver.
1. Thickness: 2 inches, unless otherwise indicated.
  2. Metal Facing Sheets, Aluminum Assemblies: Aluminum sheet, not less than 0.032-inch nominal thickness.
  3. Metal Facing Sheets, Steel Assemblies: Galvanized steel sheet, not less than 0.032-inch nominal thickness.
  4. Insulating Core: Unfaced mineral-fiber rigid insulation board.
  5. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
  6. Seal perimeter joints between panel faces and louver frames with 1/8-by-1-inch PVC compression gaskets.
  7. Panel Finish: Same type of finish applied to louvers, but black color.
  8. Attach blank-off panels to back of louver frames with stainless-steel, sheet metal screws.

## 2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish louvers after assembly.

## 2.08 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
    - a. Color and Gloss: Match Commissioner's sample; Pantone "Cool Gray No. 9U."

## 2.09 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a clean galvanized heat-treated surface prior to the application of the inhibitive primer and specified high-performance organic coating/finish.
- B. High-Performance Organic-Coating Finish: AA-C12C42R1x. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
    - a. Color and Gloss: Match Commissioner's sample.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.03 INSTALLATION

- A. Locate and place louvers and screens level, plumb, and at indicated alignment with adjacent work.

1. Variations from Level:  $\pm 1/8$  inch maximum in any column to column space or 20' - 0", non-cumulative.

- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

- C. Form closely fitted joints with exposed connections accurately located and secured.

- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07920 - Exterior Joint Sealants for sealants applied during louver and screen installation.

### 3.04 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers and screens that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

- C. Restore louvers and screens damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Commissioner, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

-END OF SECTION-



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**Section 10290**  
**BIRD AND PEST CONTROL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Bird Exclusion Netting constructed of black, UV resistant polyethylene. Knotted, square mesh effective in excluding birds of all sizes.
- B. Connection hardware for securing bird netting to different surfaces and conditions.

**1.01 RELATED SPECIFICATIONS:**

- A. Section 04201 – Unit Masonry

**1.02 SUBMITTALS**

- B. Manufacturer's literature including installation instructions and other descriptive material.
- C. Samples of each type of bird netting used not less than 6" square including proposed fastening methods and hardware.
- D. Statement by official indicating that they are a certified installation company.
- E. Documentation by the manufacturer that the installation proposed for this project is equal to other installations.

**1.03 STORAGE AND HANDLING**

- A. Provide storage to keep all netting and netting hardware shipping boxes dry, clean and undamaged. Do not stack or place other packaging or objects on the bird netting shipping boxes.
- B. Keep netting hardware and surface cleaning system in original packaging until needed for installation.

**1.04 PROJECT CONDITIONS**

- A. Field Measurements: field measure before fabrication and delivery of materials.

**1.05 COORDINATION**

- A. Coordinate installation of anchorages for cables and related items with structural elements, masonry walls, ducts, pipes, lights, conduits etc.

- B. Furnish all anchoring device required to fasten system to and around building structure and or ducts, pipes conduits etc.

1.06 WARRANTY

- A. 10-year guarantee against U.V breakdown.
- B. 1 year guarantee for installation.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Installer must be familiar with the building and areas to protect with the bird netting.
- C. Installer should contact manufacturer for any updated or newly developed planning or procedural information that may be pertinent to the bird netting installation
- D. Installer must be completely familiar with the proper installation procedures for the bird netting hardware
- E. Source Limitations: Obtain all parts and accessories through one source from a single manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Nixalite of America Inc.
  - 2. ABC Advanced Bird Control
  - 3. Bird-B-Gone, Inc.
  - 4. Or approved equal

2.02 MATERIALS

- A. Bird Netting Materials
  - 1. Bird net Material: Black, UV resistant polyethylene.
  - 2. Bird net Construction: knotted seamless netting with 40 lb. breaking strength minimum per strand. Finished edges and load bearing seams to run full length of stock size netting pieces. All knots to be steam set.

3. Mesh size: 3/4" square
4. Bird net size: Provide net in the standard manufacturer size to fit the conditions of the job.

B. Bird Netting Hardware

1. Installer to contact manufacturer for up-to-date information and recommendations for bird netting hardware applications, item combinations and new items and procedures.
2. Installer to use tensioned cable hardware and or other hardware he knows best suits the netting installation and conditions.
3. Tensioned cable hardware: Choose the connection, anchoring, cable guide and finishing hardware that best suits the installation surface and conditions. Hardware combinations can be mixed to suit changing surface materials and conditions.

C. Connection Hardware

1. Net Cable: Aircraft grade 302/304 stainless steel 7x7, 49 strand, 3/32" diameter cable. 900 lb. breaking strength. In 250' and 500' spool lengths. Hardware determines max cable run lengths.
2. Turnbuckles: Forged stainless steel, hook and eye turnbuckles sized to withstand the specific conditions of the job.  
Small: Max cable run: 25 feet Safe working load 360 lbs.  
Medium: Max cable run: 50 feet Safe working load 500 lbs.
3. Ferrules: Zinc plated copper, double sleeve ferrules for 3/32" cable. Acceptable connection for cable runs up to 25' max. Always use 2 ferrules per connection. Always use in conjunction with Cable Thimble.
4. Wire Rope Clamps: Galvanized or 302 stainless steel for 1/16" to 3/32" diameter cable and rope. Preferred connection for cable runs up to 50' max. Always use 2 clamps per connection. Always use in conjunction with Cable Thimble.
5. Cable Thimble: 316 stainless steel, drop forged cable thimble. For 1/16" to 3/32" (1.5mm to 2.2mm) diameter cable and rope. Prevents cable fraying and creasing when tensioning cable system.

**D. Cable Anchoring Hardware**

1. Eyebolts: for steel, iron, and heavy gauge sheet metal. Extreme duty stainless steel eyebolt, 2" long, 9/16" I.D. with 1/4-20 stainless steel hex nut. Max spacing between eyebolts: as recommended by manufacturer.
2. Screw Eyes: for heavy to medium gauge sheet metal surfaces. Extreme duty stainless steel screw eyes 2" long, 17/32" I.D. Pilot holes recommended for all surfaces. Max spacing between screw eyes: as recommended by manufacturer
3. Eyebolts and Machine Screw Anchors: for concrete, masonry block, and pre-cast surfaces. Eyebolt specs are same as above. Machine Screw Anchor: Zinc plated anchor – 1/2" diameter x 1" deep with 1/4-20 threads inside. Setting tool included with anchors.

**E. Cable Guide Hardware**

1. Cotter Pin & Nylon Anchor: for concrete, masonry block, pre-cast. Cotter Pin: 1/8" x 1" (3 x 25.4mm) 302 stainless steel. Nylon Anchor: 1/4" x 1" (6.3 x 25.4mm) nylon expansion anchor. Max spacing (center-to-center): 24"(61cm)
2. Small Screw Eyes: for medium/light gauge sheet metal and wood core surfaces. Heavy-duty stainless steel, 1-3/16" long x 7/32" I.D. Max spacing (center-to-center): 24".
3. Small Eyebolts: for steel, iron, and heavy gauge sheet metal. Heavy-duty stainless steel, 1 3/8" long x 9/32" I.D. Max spacing (center-to-center): 24".
4. Sidewinders: for heavy gauge sheet metal and structural steel up to 1/2" thick. Self-drilling, self-tapping, stainless, no pilot required. . Max spacing (center-to-center): 24". Requires 1 driver socket per 100.

**F. Finishing Hardware**

1. Net Rings: Stainless steel, 11/16" ring blank with 5/16" I.D.
2. Netting to cable: Use 16 net rings per foot (each netting mesh). Lapped seams: Use 32 net rings per foot (1 per mesh each side of seam). Zipper Installation: Use 32 net rings per foot (1 per mesh each side of zipper).
3. Poly Clip: can be used in place of Net Rings when attaching the netting to the cable system. Made from UV stabilized black polypropylene. Max. Spacing (center-to-center): 12".
4. Net Zipper: 4 ft. lengths. Heavy-duty marine grade black zipper with 3/4" to allow access to areas behind the bird netting installation.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Visually inspect the surfaces that will receive the netting hardware and all areas that will end up behind or inside the netting installation. Note damaged surfaces or incomplete construction that could compromise the bird netting installation.
- B. Note all areas, surfaces or objects that may require maintenance or periodic replacement after the bird netting is installed (i.e. lights, electrical equipment, etc.). Plan on using the appropriate netting hardware to allow access after installation.
- C. Note any objects or conditions that could damage the installed bird netting. Plan on installing the net in such a manner as to avoid these conditions.

### 3.02 PREPARATION

- A. Field Measurements: Verify dimensions of the areas to be enclosed. Make sure there is sufficient quantity of bird netting, netting hardware and surface cleaning products to properly install the bird netting system.

### 3.03 SURFACE CLEANING

- A. All surfaces to be clean dry and free of obstructions before bird control is installed.
- B. If bird waste is present: Treat, neutralize and safely remove all bird waste from installation surfaces. Installer must follow all city, state and federal regulations regarding the proper removal and disposal of bird droppings.
- C. Allow all surfaces to air-dry completely before proceeding.
- D. Installer to use anti-bacterial soap and lotion to help prevent disease transmittal when working around surfaces contaminated with bird droppings.

### 3.04 INSTALLATION

- A. Install the bird netting hardware as recommended by manufacturer. General order of installation: install perimeter and support netting hardware; attach bird netting to installed hardware; install access or additional support hardware as specified.
- B. Install bird netting as recommended by the manufacturer. If necessary cut the net to fit the area. Strictly follow the manufacturer's instructions for cutting the net. If multiple pieces are needed, join the pieces together with the recommended seam fastening hardware.

- C. Install the bird netting to avoid contact with machinery, vehicles, extreme heat, etc. Make necessary adjustments to keep netting a sufficient distance from these objects or conditions.
- D. Finished bird netting installation to be taut, free of wrinkles, gaps and openings.

3.05 ADJUSTMENT AND CLEANING

- A. Remove debris and waste materials from project site.
- B. Inspect finished installation. Make any adjustments needed to conform to manufacturer recommendations.

-END OF SECTION-

**Section 10350  
FLAG POLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes ground-set flagpoles made from stainless steel

**1.02 RELATED SPECIFICATIONS:**

- A. Section 03300 -Cast-in-Place Concrete.
- B. Section 07920 -Joint Sealants.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
  - 1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
  - 2. Basic Wind Speed: 90 mph; 3-second gust speed at 33 feet aboveground.

**1.04 SUBMITTALS**

- A. Product Data: For each type of flagpole required.
- B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems.
  - 1. Include details of foundation system for ground-set flagpoles.
- C. Structural Calculations: For flagpoles indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Finish Samples for Verification: For each finished material used for flagpoles and accessories.
- E. Qualification Data: For professional engineer.



## 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1. Obtain flagpoles through one source from a single manufacturer.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Flagpole; a Kearney-National Inc. Company
2. Concord Industries, Inc.
3. Pole-Tech Company Inc.

## 2.02 FLAGPOLES

- A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. For stepped-sectional flagpoles, provide self-aligning, snug-fitting joints.

- B. Exposed Height: As shown in the drawings

- C. Stainless-Steel Flagpoles: Provide cone-tapered flagpoles fabricated from pipe, tube, or plate complying with ASTM A 312, ASTM A 269, or ASTM A 666, alloy UNS S31603.

- D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch-minimum nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.
2. Provide steel ground protectors extending 12 inches aboveground and 6 inches belowground for steel flagpoles where flashing collars are not provided.

## 2.03 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
  1. Spun stainless steel, finished to match flagpole.
- B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
- C. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.
  1. Provide with neoprene or vinyl covers.
- D. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Provide two flag clips per halyard.
  1. Product: Subject to compliance with requirements, provide "Quiet Halyard Flagclasp" by Lingo Inc.; Acme Flagpole Division.

## 2.04 MISCELLANEOUS MATERIALS

- A. Concrete: Provide concrete composed of portland cement, coarse and fine aggregate, and water mixed in proportions to attain a 28-day compressive strength of not less than 3000 psi, complying with ASTM C 94/C 94M.
- B. Sand: ASTM C 33, fine aggregate
- C. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

## 2.05 FINISHES

- A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Stainless Steel: Grind and polish surfaces to produce uniform, bright, directional polished finish (No. 4 finish), free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.
- D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

### 3.02 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate Installation: Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

-END OF SECTION-

**Section 10436**  
**EXTERIOR SIGNS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
1. Exterior, porcelain enamel, panel-type signs and support frames, as indicated.
  2. Dimensional characters and logos for exterior use, as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03450 - Plant-Precast Architectural Concrete
- B. Section 05120 - Structural Steel
- C. Section 05500 - Metal Fabrications
- D. Section 08630 - Translucent Insulating Panels
- E. Section 09911 - Exterior Painting

**1.03 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide panel signs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures".
1. Wind Loads: Determine loads based on a uniform pressure of 40 lbs/sq.ft.; acting in any direction.
- B. Thermal Movements: Provide panel signs that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- C. Design: The drawings indicate minimum dimensions and thickness for components. Where performance requirements require thickness of material to be increased or additional reinforcing to be added such revisions shall be made without changing the visible profiles of sign elements. Where changes cannot be made without changing visible profiles they shall be made only with approval by the Commissioner.

- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.04 DEFINITIONS

- A. Porcelain Enamel: Porcelain enamel on steel is a substantially vitreous, or glassy, inorganic coating bonded to metal by fusion at temperatures above 1400° Fahrenheit.
  - 1. Baked paints or organic enamels will not be considered equivalent sign materials/finishes.
- B. Frits/Glazes/Oxides: Only specially formulated porcelain enamel frits, glazes and oxides as supplied by Ferro, Chivit, APEC or Cerdek. These materials when combined and processed in final form shall be acid resistant in order to achieve an A or AA acid resistance rating.
- C. Art/Graphics: The graphic material and images including logos, mechanicals, text, photographs and other graphic source materials.

#### 1.05 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include manufacturer's written instructions for maintaining and cleaning sign surfaces.
- B. Shop Drawings: Show fabrication and installation details for bracket supported panel signs, and exterior pin-mounted dimensional character signage. Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
  - 1. Plans and elevations shall be drawn at 3/4-inch scale (minimum); include sections of typical members and other components.
  - 2. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
  - 3. Include DSNY seal list, with details of wording and lettering layout, at least half size. Include full-size details of graphics.
    - a. Include full-size templates for characters and graphic symbols.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
  - 1. Porcelain enamel steel sheet.

- D. Samples for Verification: For each type of product indicated, of size below:
1. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.
  2. Porcelain Enamel Panel: 8 by 10 inches for each color required.
    - a. Include a sample of graphic-image process. Show graphic style and colors and finishes of letters, numbers, and other graphic devices.
  3. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
- E. Calculations: Submit calculations, signed and sealed by a Professional Engineer licensed in the State of New York. Calculations shall indicate the basis of design and all resulting loading. Design connections in accordance with the requirements for building design as required by local code. Include certification by design engineer of the adequacy of design.
- F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- 1.06 QUALITY ASSURANCE
- A. Installer Installer/Fabricator Qualifications: Engage an experienced installer who is also the manufacturer of the signs and who has completed manufacturer and installation of signs similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
1. The Installer/Fabricator shall be capable of providing replacement signs within 10 working days of receipt of an order.
  2. Prior to fabrication of Work, submit references of at least 3 clients who have used their services.
  3. Prior to fabrication of work, submit proof of sufficient experience subject to approval of the Commissioner and The City of New York. Submit experience is defined as follows:
    - a. Minimum of three (3) years experience.
    - b. Successful completion of 3 projects of similar size and scope to this project.
- B. Source Limitations: Obtain custom panel signs through one source from a single manufacturer.

- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of bracket supported panel signs.

- 1. Do not modify intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If modifications are proposed, submit comprehensive explanatory data to Commissioner for review.

#### 1.07 DELIVERY AND HANDLING

- A. Deliver bracket supported panel signs in protective covering and crating to protect sign components and surfaces against damage.

#### 1.08 COORDINATION

- A. Coordinate installation of anchorages for bracket supported panel signs. Furnish setting drawings, templates, and directions for installing anchorages and other items that are to be supported by building superstructure. Deliver such items to Project site in time for installation.
- B. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
  - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.
- C. Coordinate delivery time so signs can be installed within 24 hours of receipt at Project site.

#### 1.09 WARRANTY

- A. Porcelain Enamel Panel Sign Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace bracket supported porcelain panels that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Coating degradation
  - 2. Chalking
  - 3. Fading
  - 4. Enamel delamination, chipping, cracking and crazing
  - 5. Rusting
  - 6. UV degradation
- B. Dimension Character/Medallion Sign Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

C. Warranty Period

1. Porcelain Enamel Sign Failures: Twenty-five years from date of Substantial Completion.
2. Dimensional Character/Medallion Failures: Fifteen years from date of Substantial Completion.
3. Workmanship: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Porcelain Enamel Signage
  - a. Letterbank, Inc.
  - b. The Wallbridge Corp.
  - c. KVO Industries
  - d. Or approved equal
2. Aluminum Pin-Mounted Signage
  - a. American Graphics Inc.
  - b. Metal Arts; Div. of L&H Mfg.
  - c. Signature Sign Signs, Inc.
  - d. Or approved equal

2.02 MATERIALS

- A. General: For surfaces exposed to view or coated in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:
1. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads. Galvanized finish unless otherwise indicated.
  2. Steel Plate, Shapes, and Bars: ASTM A 36. Galvanized finish unless otherwise indicated.



- C. Steel for Porcelainizing: For purposes of this specification, steel is special purpose "vitreous or enameling iron or steel" as defined by ASTM A 424 Type 1, tensioned leveled and especially manufactured for the purpose of porcelain enameling with total additions of copper and aluminum no greater than .002. Gauges of base metal as required to meet the tolerances specified.
- D. Aluminum Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15.
  - 1. Graphic Content and Style: Provide sign copy (artwork) that complies with requirements indicated on the Drawings, and on the approved shop drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
  - 1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C
- F. Colored Pigments: Nonfading pigments. Use coatings that are recommended by manufacturers for color fastness and durability.

## 2.03 ACCESSORIES

- A. Mounting Methods: Use concealed fasteners fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Anchors and Inserts: Provide stainless steel or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- C. Fasteners: Use concealed fasteners fabricated from stainless steel that are noncorrosive to sign material and mounting surface.
- D. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength, and compatibility in the fabricated items.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint for reglazing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

## 2.04 FABRICATION, GENERAL

- A. Provide manufacturer's standard bracket supported panel signs of configurations indicated.
1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
  2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
  3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
  4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

## 2.05 SIGN PANELS

- A. General: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
- B. Porcelain Enamel Panels Signs:
1. Panel Face: Seamless, 0.0677" (14 gage minimum), cold-rolled, stretched leveled steel sheet
  2. Panel Finish: Gloss porcelain enamel, 0.010" thick (minimum) fused coating/finish. Finished panel assemblies shall be free of burn-off, exposed substrate edges and other such defects.
  3. Panel Frame Material: Matching panel face, unless otherwise recommended by the manufacturer and acceptable to the Commissioner. Provide panel flange dimensions of the size, configuration and profile as indicated on the approved Shop Drawings.
    - a. Frame Finish: Gloss porcelain enamel, 0.012" thick (minimum) fused coating/finish. Finished frame assemblies shall be free of burn-off, exposed substrate edges and other such defects.

- b. Corner Condition: Corners rounded to radius indicated.
- 4. Cutting, tooling, welding, cutting, grinding and other modifications to each panel sign must be completed prior to application/firing of the porcelain enamel coating/finish system.

## 2.06 DIMENSIONAL CHARACTERS

- A. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 6063-T5.
- C. Cutout Characters: Cut characters from solid aluminum plate of thickness indicated. Produce precisely cut characters with square cut, smooth, eased edges. Comply with requirements indicated for finish, style, and size.

## 2.07 GRAPHICS

- A. Projecting Characters: Provide projecting characters that are formed from laser cut cold rolled steel, properly prepared finished and secured to back-up/substrate panel as indicated on the approved Shop Drawings

## 2.08 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Porcelain Enameling: Provide porcelain enamel finishes that comply with the minimum requirements of ASTM C 703, and ASTM C 448, and other requirements as recommended by the Porcelain Enamel Institute (PEI).
  - 1. All necessary holes and cutouts shall be drilled or punched and welded in advance of enameling, with edges sufficiently ground to hold a porcelain coating.
  - 2. All panels shall be degreased by immersion in an approved degreasing fluid. The panels shall then be rinsed in a heated water bath.
  - 3. After the first rinse, panels shall be immersed in a caustic solution sufficient to provide an "etched" surface capable of good porcelain adherence. The panels shall then be rinsed.

4. After the third rinse, the chemical action shall be neutralized in a soda ash solution then dried rapidly.
  5. A porcelain enamel ground coat shall be applied to all areas of each unit, including backside and flanges, by spraying methods recognized by PEI and VEDC. At least one additional separately fired cover-coating shall be applied to the face side and flanges of each unit. For corrosion protection and flatness, one additional coating shall be applied to the backside of each panel. Provide approved graphics.
    - a. Continuity of Coating: Visual inspection of each unit shall reveal no visible breaks, gas bubbles, scumming, hairlines, stress lines or surface defects in the cover coat.
    - b. The color and finish shall match a color sample previously submitted by supplier and approved by Commissioner and The City of New York within 1 NBS unit (1-2 NBS unit variation is barely perceptible to the human eye.)
    - c. Ground and cover coat thickness shall be applied in accordance with PEI recommendations to a thickness range between 0.004 to 0.020", as required by the manufacturer to suit the intended use.
    - d. Panels shall be fired in a furnace custom designed for the purpose, at temperatures above 1400 Fahrenheit. After firing, every panel is submitted to a visual inspection for color consistency against the control panel as approved by the designer/client.
    - e. Colors and Textures: For exposed sign material that requires selection of materials with integral or applied colors, textures, or other characteristics related to appearance, provide color matches as selected by Commissioner from manufacturer's standards.
- D. High-Performance Organic Finish (Pin-Mounted Signage): AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
  2. Color and Gloss: Matching Commissioner's sample.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Coordinate sign supports with other trades. Provide installation details for coordination.
- B. Sign Supports: Locate sign units and accessories where indicated, using mounting methods of type described and complying with manufacturer's written instructions.
  - 1. Set anchor bolts and other embedded items required for installation. Use templates, setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- C. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
  - 1. Projected Mounting: Mount characters at projection distance from wall surface indicated utilizing the manufacturer's aluminum pin-mounting method. Exposed pin-mount assemblies shall be finished with a high-performance organic coating system matching the dimensional character type signage.
  - 2. Color: Provide pin-mount hardware finished in black, unless otherwise directed to match color of actual dimensional characters.
- D. Install signs level, plumb, and at height indicated, with surfaces free from distortion or other defects in appearance.

### 3.02 CLEANING

- A. At completion of installation, clean soiled surfaces of sign units according to manufacturer's written instructions.

-END OF SECTION-

**Section 10440**  
**INTERIOR SIGNS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

A. This Section includes the following:

1. Panel signs
2. Cast-metal plaque
3. Safety stripes tape
4. Signage accessories

**1.02 RELATED SECTIONS**

- A. Section 09010 - Room Finish Schedule.
- B. Section 10436 - Exterior Signs.
- C. Section 15076 - Piping and Equipment Identification.

**1.03 REFERENCES**

- A. ASTM B209- Aluminum and Aluminum-Alloy Sheet and Plate
- B. ASTM B221- Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- C. ASTM B584- Copper Alloy Sand Castings for General Applications
- D. NFPA 101 - National Fire Protection Association Life Safety Code
- E. NFPA 170 - National Fire Protection Association Standard for Fire Safety Symbols
- F. NYC Building Code Chapter 27
- G. OSHA 1910.144 - Safety Color Code for Marking Physical Hazards
- H. OSHA 1910.145 - Specification for Accident Prevention Signs and Tags
- I. OSHA 1910.157 - Portable Fire Extinguishers

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.

- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- C. Shop Drawings: Include location plan for all sign types, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
  - 1. Provide message list for each sign, including large-scale details of wording, size and style of lettering, colors and braille layout.
- D. Samples for Initial Selection: For each type of sign material indicated that involves color selection
- E. Samples for Verification: For each type of sign, include the following samples to verify color selected:
  - 1. Panel Signs: Full-size samples of each type of sign required
  - 2. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
  - 3. Approved samples will not be returned for installation into Project.
- F. Qualification Data: Submit qualifications of proposed installer.
- G. Maintenance Data: Submit signage cleaning and maintenance requirements to include in maintenance manuals.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be an employer of workers trained and approved by signage manufacturer.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
  - 1. Interior Code Signage: Provide signage as required by requirements of authorities having jurisdiction.

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers of the various types of signs are listed in the following subsections. Other manufacturers may be submitted for approval provided their products comply with the requirements of these specifications.

## 2.02 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

- 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.

- B. Manufacturers

- 1. ASI Sign Systems, Inc.
  - 2. Best Sign Systems, Inc.
  - 3. Brady Signmark Division.
  - 4. Innerface Sign Systems, Inc.
  - 5. Mohawk Sign Systems
  - 6. Seton Identification Products

- C. Cast-Acrylic Sheet: Manufacturer's standard and as follows:

- 1. Color: As selected by the Commissioner from manufacturer's full range.

- D. Plastic Laminate: Provide high-pressure laminate engraving stock with face and core plies in contrasting colors as selected by the Commissioner from manufacturer's full range.

- E. Aluminum Sign Panels

- 1. Aluminum sheets and plates shall conform to ASTM B209, Alloy 6061-T6.
  - 2. Fabricate panels from standard sheet widths. The thickness for panel sizes of 30 inches by 30 inches or smaller shall be 0.080 inch and the thickness of larger panels shall be 0.125 inch unless otherwise shown on the Contract Drawing M-640.
  - 3. The panel blanks shall be free from laminations, blisters, open seams, pits, holes, or defects that may affect their strength, appearance or use. The thickness shall be uniform and the blanks shall be commercially flat.



- F. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
1. Edge Condition: Square cut
  2. Corner Condition: Square
- G. Laminated Panels: Permanently laminate face panels to backing sheets of material; use manufacturer's standard process.
- H. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Paint brackets in factory in color matching background color of panel sign. Aluminum extrusions shall meet the requirements of ASTM B221. Alloy and temper shall be as recommended by the aluminum producer and finisher for the type of use and finish indicated, and with not less than the strength and durability properties of Alloy 6063.T5.
- I. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule in Subsection 3.04 and on the Contract Drawings for size, text, colors, location, mounting height and material.
- J. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.
1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
  2. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
  3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to back face of acrylic sheet.
- K. Subsurface Copy: Apply minimum 4-mil- thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free from rough edges.
- L. Subsurface Engraved Acrylic Sheet: Reverse-engrave back face of clear acrylic sheet. Fill resulting copy with enamel. Apply opaque background color coating over enamel-filled copy.
- M. Colored Coatings for Acrylic Sheet: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for application intended.

## 2.03 CAST-METAL PLAQUES

- A. General: Provide castings free from pits, scale, sand holes, and other defects. Comply with requirements specified for metal, border style, background texture, and finish and in required thickness, size, shape, and copy.
- B. Manufacturers
  - 1. American Graphics Inc.
  - 2. Matthews International Corporation; Bronze Division
  - 3. Metal Arts; Div. of L&H Mfg.
  - 4. York Bronze/Bryan
- C. Bronze Castings: ASTM B 584, alloy UNS No. C83600 (No. 1 manganese bronze).
- D. Border Style: None (straight)
- E. Background Texture: Matte finish
- F. Mounting: Rosettes and fasteners matching plaque finish

## 2.04 PANEL SIGN TYPES

- A. Room Signs
  - 1. Material: Cast acrylic sheet with reverse screen text and back spray color.
  - 2. Perimeter: Unframed
  - 3. Copy: Subsurface
  - 4. Character Style: Helvetica medium upper case
  - 5. Text: Room name and number as indicated in the Room Finish Schedule
  - 6. Message: Fixed
  - 7. Sizes:
    - a. Sign: 8-inch wide by 6-inch high
    - b. Character: 1 inch high room number, and 5/8-inch high room name
  - 8. Colors
    - a. Character: white
    - b. Background: black
- B. Toilet Room Signs
  - 1. Material: Cast acrylic sheet with reverse screen text and back spray color.
  - 2. Perimeter: Unframed

3. Copy: Subsurface
4. Character Style: Helvetica medium upper case
5. Graphics: International symbol for men and or women toilets
6. Text: Room name as indicated in the Room Finish Schedule
7. Message: Fixed
8. Sizes
  - a. Sign: 6 inches wide by 8 inches high. Height can be increased to fit large room names
  - b. Character: 1 high room # and 5/8" high room name
9. Colors
  - a. Character: White
  - b. Background: Black

C. Floor Diagram Signs

1. Material: Cast acrylic sheet with reverse screen text and back spray color. Screening in two colors.
2. Perimeter: Unframed
3. Character Style: Helvetica medium upper case
4. Text
  - a. "Evacuation Plan" located above plan layout
  - b. "No Smoking" text with no smoking symbol located below plan layout
5. Message: Fixed.
6. Size
  - a. Sign: 17-1/2" wide by 13-1/2" high
  - b. Character: Sized to be legible from 2 feet
7. Colors
  - a. Character: Black
  - b. Background: White

**D. Stair Identification Signs**

1. Material: Cast acrylic sheet with reverse screen text and back spray color.
2. Perimeter: Unframed
3. Copy: Subsurface
4. Character Style: Helvetica medium upper case
5. Text
  - a. "STAIR A" (insert appropriate stair identification letter)
  - b. "A" (insert appropriate stair identification letter) located in the middle of the lower half part of the sign.
  - c. "1 THROUGH 3" (insert appropriate stair level numbers) located under stair identification letter.
6. Message: Fixed
7. Sizes
  - a. Sign: 12inches wide by 12inches high
  - b. Character: 5inches high stair identification letter and 1inch high other characters
8. Colors
  - a. Character: Black
  - b. Background: White

**E. Safety Signs**

1. Signs are classified as follows:
  - a. Danger sign: Indicate immediate danger and that special precaution are necessary. Color scheme to be a red panel with white letters on a black background. Min. size 14" w x 10" h.
  - b. Caution sign: Warn against potential hazards or caution against unsafe practices. Color scheme to be yellow background with a black panel with yellow letters. Min. size 14" w x 10" h.

- c. Safety instruction sign: Conveys general instructions and suggestions relative to safety measures. Color scheme to be white background with a green panel with white letters. Min. size 14" w x 10" h.
  - d. Fire Prevention Sign: Fire prevention signs indicate the location of exits or emergency fire fighting equipment. Color scheme to be white background with red letters. Fire extinguisher sign to show type of fire on which it is to be used, with letter and graphically. Min. size 10"w x 14"h.
  - e. Directional Signs: Indicate path of travel, other than for motorist traffic. Color scheme to be white with a black panel and with directional symbol. Any additional wording on the sign shall be black letters on the white background. Min. size 12"w x 3" h.
  - f. Notice Sign: Conveys general information or instructions. Color scheme shall white background with a cyan panel with white letters. Min size 14" w x 10" h.
  - g. Material: Fiberglass
- 2. Perimeter: Unframed
  - 3. Character Style: Helvetica medium upper case
  - 4. Text: As indicated in the Sign Schedules
  - 5. Message: Fixed
  - 6. Sizes
    - a. Sign: see 2.04.E-1
    - b. Character: Conform to OSHA Regulations 1910.145
  - 7. Colors
    - a. Character: As specified and conform to OSHA Regulations 1910.145
    - b. Background: As specified and conform to OSHA Regulations 1910.145
  - 8. Copy: Subsurface
- F. Safety Stripes Tape: Provide in accordance with the requirements of OSHA 1910.144 and as follows:
- 1. Provide 2-inch wide pressure sensitive reinforced vinyl tape, white with black stripes.

2. Provide and install a minimum of 50 yards of the tape as directed by the Commissioner.

## 2.05 ACCESSORIES

- A. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Anchors and Inserts: Provide nonferrous-metal or stainless steel anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

## 2.06 FINISHES, GENERAL

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples and are assembled or installed to minimize contrast.

## 2.07 COPPER-ALLOY FINISHES

- A. Cast-Bronze Plaque Finishes: Exposed surfaces shall be free from porosity, burrs, and rough spots, with returns finished with fine-grain air blast.
  1. Raised Areas: Hand-tool and buff borders and raised copy to produce manufacturer's standard satin finish.
  2. Background finish: Dark oxidized

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with requirements of authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install all materials specified herein in compliance with NYC Building Code, OSHA, NFPA regulations and approved manufacturer's printed specifications.
- B. Install signs after final field finish has been applied and thoroughly dried.
- C. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions. Commissioner will determine the final location of each sign.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
  - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable, with top sign edge at 5'6" above finish floor. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- D. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
  - 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  - 2. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
  - 3. Shim Plate Mounting: Provide 1/8-inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
  - 4. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for

secure attachment to substrate as recommended in writing by sign manufacturer.

5. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

E. **Bracket-Mounted Units:** Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

1. **Flush Mounting:** Mount characters with backs in contact with wall surface.
2. **Projected Mounting:** Mount characters at projection distance from wall surface indicated.

F. **Cast-Metal Plaques:** Mount plaques using standard fastening methods recommended in writing by manufacturer for type of wall surface indicated.

1. **Concealed Mounting:** Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.
2. **Face Mounting:** Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

### 3.03 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturers written instructions. Protect signs from damage until acceptance by City.

### 3.04 SIGN SCHEDULE

Sign Number	Type	Text	Location
1	Fire prevention	Fire extinguisher	At each portable extinguisher location
2	Fire prevention	Not an Exit	At Doors 110-2, 127-4, 124-2, 127-3, 127-2, 128-2, 128-3, 205-1 and 402-1
3	Danger	High voltage	At Doors 120-1, 120-2, 310-1, and 310-2.
4	Danger	High voltage	At battery rack area.
5	Danger	No smoking	At Rooms 112, 115, 118, 120, 121, 216, and 310.
5	Danger	Confined space	At access doors in Rooms 112



Sign Number	Type	Text	Location
		Do not enter	and 215
6	Notice	No food or drinks beyond this point	At door 106-1
7	Safety instruction	Eye wash station	At every eye wash station
8	Caution	Watch your head Clearance 6'-4"	At Door 202-2
9	Caution	Watch your head Clearance 5'-0"	In Room 202 at beams B/16-17, 14/A-B, and 16/A-B
10	Caution	Clearance 17'-7"	At Door 216-1 lintel
12	Caution	Carbon monoxide may be present	At Room 216
13	Caution	Welding fumes may be present	At Room 216
14	Caution	Eye protection must be worn when cleaning with compressed air	At Room 216
15	Directional	Lunch room	In Corridor 106 on wall opposite Door 124-1. In corridor 106 at right end of wall right of Door 108-1
16	Directional	Operations Room	In vestibule C on wall opposite Door 302-1
17	Identification	Room name as per room finish schedule	Top of sign is 5'-0" above finish floor on lockset wall side and 2" away from the exterior doorframe's edge.
18	Identification	Floor diagram	At each landing inside stairs A,B,C and D. next to exit door same as sign number 17

-END OF SECTION-

**Section 10505**  
**PHENOLIC LOCKERS AND BENCHES**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Full height door phenolic lockers
  - 2. Phenolic locker benches

**1.02 RELATED SPECIFICATIONS**

- A. Sections related to HVAC and mechanical exhaust system connection to metal lockers.
- B. Section 09310 Ceramic Tile, 09912 Interior Painting, 10155 Toilet Compartments in conjunction with color selection.

**1.03 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show base, sloping tops, filler panels, recess trim and other accessories.
  - 2. Include locker identification system.
- C. Samples for Initial Selection: Provide actual sample of locker cutout for color finishes and material.
- D. Samples for Verification: For lockers, type of locking system, locker benches, all hardware and fasteners provided by the manufacturer.
- E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: An authorized representative of locker manufacturer for installation and maintenance of units required for this Project.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of lockers and are based on the specific system indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

**1.06 PROJECT CONDITIONS**

- A. Field Measurements: Verify the following by field measurements before fabrication and indicate measurements on Shop Drawings:
  - 1. Concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed.
  - 2. Recessed openings.
  - 3. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

**1.07 COORDINATION**

- A. Coordinate size and location of concrete bases for the lockers.
- B. Coordinate size and location of the mechanical duct for locker ventilation.
- C. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

**1.08 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, including finish, within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures
  - 2. Faulty operation of latches and other door hardware

**1.09 EXTRA MATERIALS**

- A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than 5 units:
  - a. Hasps
  - b. Identification plates
  - c. Hooks
2. Warranty Period: 3 years after substantial completion

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

### 2.02 MATERIALS

- A. Solid phenolic lockers: Locker side panels, tops, bottoms, doors and shelves. Polished radius corners and edges.
  1. 3/8" thick standard insides and end-caps. Provide colored end panels.
  2. 1/2" tops, bottoms doors and shelves. Perforated tops.
  3. Locker configuration: Single tier
- B. Fasteners: #4 Satin finish stainless steel fasteners.
- C. Locking device: Stainless steel hasp system for padlock
- D. Internal accessories: Stainless steel door hooks
- E. Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.
  1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
  2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- F. Manufacturers
  1. DeBourgh Mfg. Co.; Worley Lockers
  2. General Storage Systems, Div. of North American Steel
  3. Hadrian Inc.; Emperor Lockers
  4. Lockers USA
  5. Lyon Workspace Products; Standard Lockers
  6. Penco Products, Inc., Subsidiary of Vesper Corporation
  7. Tennsco Corp.; Tennsco Lockers

- G. Doors: Solid ½" thick, one-piece door
  - 1. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed.
- H. Hinges: Self-closing; completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
  - 1. Manufacturer's standard, steel continuous or knuckle type.
- I. Door Handle and Latch for Box Lockers: Strike plate with integral pull; with steel padlock loop that projects through locker door.
- J. Locker Identification: Each metal locker with identification plate.
- K. Accessories:
  - 1. Continuous Sloping Tops
  - 2. Shelves: Provide 2 shelves located at 15" and 28" above floor
    - a. Closures: Hipped-end type
    - b. Sloped top corner fillers, mitered
  - 3. Filler Panels
- L. Locker Arrangement: As indicated on Drawings.

## 2.03 LOCKER BENCHES

- A. General: Provide locker benches fabricated by same manufacturer as metal lockers.
- B. Bench Tops: Manufacturer's standard 1-piece units, of the following material, 10 inches wide by ¾ inches thick, with rounded corners and edges:
  - 1. Phenolic bench top running full length of top and positioned to receive pedestal fasteners.
    - a. Color: Match lockers as selected by Architect from manufacturer's full range.
- C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
  - 1. Tubular Steel: Stainless steel tubing, with steel flanges welded at top and base; with satin finish; anchored with exposed fasteners.
    - a. Color: As selected by Commissioner from manufacturer's full range.

## 2.04 FABRICATION

- A. General: Fabricate lockers square, rigid, and without warp; with phenolic faces flat and free of dents or distortion. Make exposed metal edges are polished and safe to touch.
  - 1. Form body panels, doors, shelves, and accessories from one-piece phenolic, unless otherwise indicated.
  - 2. Provide fasteners, filler plates, supports, clips, and closures as required for a complete installation.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by manufacturer
  - 2. Anchor single rows of lockers to walls
  - 3. Anchor back-to-back metal lockers to floor
- B. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach hooks with at least two fasteners.
  - 2. Attach door locks on doors using security-type fasteners.
  - 3. Identification Plates: Identify lockers with identification indicated on Drawings.
    - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
  - 4. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
  - 5. Attach sloping top units to lockers, with closures at exposed ends.

6. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed lockers.
  7. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed lockers.
- C. Fixed Locker Benches: Provide not less than 2 pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

### 3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Protect lockers and benches from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- C. Touch up marred finishes, or replace lockers and benches that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

-END OF SECTION-

**Section 10520**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL****1.01 SUMMARY**

A. This Section includes the following:

1. Portable fire extinguishers as shown on the drawings and scheduled herein
2. Fire-protection cabinets for portable fire extinguishers
3. Mounting brackets for fire extinguishers

**1.02 RELATED SPECIFICATIONS**

- A. Section 07842 - Fire -Resistive Joint Systems, for firestopping sealants at fire-rated cabinets.
- B. Section 10440 - Interior Signs, for directional signage to out-of-sight fire extinguishers and cabinets.

**1.03 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
1. Fire Extinguishers: Include rating and classification.
  2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on samples 6 inches square.
- D. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

**1.04 QUALITY ASSURANCE**

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."



- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

- 1. Provide fire extinguishers approved, listed, and labeled by FMG.

#### 1.05 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

#### 1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10
  - 2. Warranty Period: Six years from date of Substantial Completion

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B
- B. Stainless-Steel Sheet: ASTM A 666, Type 304
- C. Wire Glass: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick

#### 2.02 PORTABLE FIRE EXTINGUISHERS

- A. Manufacturers
  - 1. Ansul Incorporated
  - 2. Badger Fire Protection
  - 3. Buckeye Fire Equipment Company
  - 4. Fire End & Croker Corporation
  - 5. General Fire Extinguisher Corporation
  - 6. JL Industries, Inc.
  - 7. Kidde Fyrnetics
  - 8. Larsen's Manufacturing Company
  - 9. Modern Metal Products; Div. of Technico
  - 10. Potter Roemer; Div. of Smith Industries, Inc.
  - 11. Watrous; Div. of American Specialties, Inc.

- B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- C. ABC Multi-Purpose Dry Chemical, 10 lbs, UL Rating 4A:80B:C Red glossy polyester coated steel cylinder with pressure gauge, mount and hose. Model No. 3010 as manufactured by Potter Roemer or approved equal.
- D. ABC Multi-Purpose Dry Chemical, 20 lbs, UL Rating 20A:120B:C Red glossy polyester coated steel cylinder with pressure gauge, mount and hose. Model No. 3020 as manufactured by Potter Roemer or approved equal.

## 2.03 FIRE-PROTECTION CABINET

- A. Manufacturers
  - 1. Fire End & Croker Corporation
  - 2. General Accessory Mfg. Co.
  - 3. JL Industries, Inc.
  - 4. Kidde Fynetics
  - 5. Larsen's Manufacturing Company
  - 6. Modern Metal Products; Div. of Technico
  - 7. Potter Roemer; Div. of Smith Industries, Inc.
- B. Cabinet Type: Surface mount - suitable for fire extinguisher
- C. Cabinet Construction: 1-hour fire rated
- D. Cabinet Material: Stainless-steel sheet
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Stainless steel sheet
- G. Door Glazing: Wire glass
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide manufacturer's standard.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

## I. Accessories

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Commissioner.
  - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER".
    - 1) Location: Applied to cabinet door
    - 2) Application Process: Pressure-sensitive vinyl letters
    - 3) Lettering Color: Black
    - 4) Orientation: Horizontal

## J. Finish: Brushed satin

## 2.04 MOUNTING BRACKETS

## A. Manufacturers

1. Amerex Corporation
2. Ansul Incorporated
3. Badger Fire Protection
4. Buckeye Fire Equipment Company
5. Fire End & Croker Corporation
6. General Fire Extinguisher Corporation
7. JL Industries, Inc.
8. Larsen's Manufacturing Company
9. Potter Roemer; Div. of Smith Industries, Inc.

- B. Mounting Brackets: Manufacturer's standard stainless steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.

- C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Commissioner.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied horizontally to mounting surface.

## 2.05 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled stainless steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.
    - a. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
  - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.06 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.07 STAINLESS-STEEL FINISHES

- A. General: Remove tool and die marks and stretch lines or blend into finish.
  - 1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Satin, Directional Polish: No. 6 finish.

- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
  - 1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
  - 2. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
  - 1. Provide inside latch and lock for break-glass panels.
  - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- D. Identification: Apply decals at locations indicated.

#### 3.03 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.04 FIRE EXTINGUISHER SCHEDULE

- A. Provide fire extinguishers, cabinets and mounting brackets as specified herein and shown on the Contract Drawings.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 10801**  
**TOILET AND BATH ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Public-use washroom accessories
- B. Public-use shower room accessories
- C. Private-use bathroom accessories
- D. Warm-air dryers
- E. Underlavatory guards
- F. Custodial accessories

**1.02 RELATED SPECIFICATIONS**

- A. Section 10155 - Toilet Compartments
- B. Sections related to Plumbing Work

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated on Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.



#### 1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### 1.05 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.06 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

#### 2.02 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation
5. General Accessory Manufacturing Co. (GAMCO)

B. Toilet Tissue (Jumbo-Roll) Dispenser with Stainless Shelf

1. Shelf fabricated of Type 304
2. Description: Two-roll unit with sliding panel to expose other roll
3. Mounting: Surface mounted
4. Capacity: 9- or 10-inch-diameter rolls
5. Material and Finish: 18 gauge Stainless steel, No. 4 finish (satin)
6. Quantity/Location: Provide one (1) per stall. As indicated on Drawings.

C. Combination Towel (Roll) Dispenser/Waste Receptacle

1. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
2. Mounting: Recessed
3. Minimum Towel-Dispenser Capacity: 1100 single-fold, 800 multi-fold or 600 c-fold towel
4. Minimum Waste Receptacle Capacity: 5.75 gal.
5. Material and Finish: Stainless steel, No. 4 finish (satin)
6. Lockset: Tumbler type for towel dispenser compartment and waste receptacle
7. Quantity/Location: As indicated on Drawings.

D. Liquid-Soap Dispenser

1. Description: Designed for dispensing soap in liquid with tow soap valves.
2. Mounting: Deck mounted on
3. Capacity: 80 oz.
4. Materials: 20-gauge stainless steel with satin finish.
5. Lockset: Tumbler type
6. Refill Indicator: Window type
7. Quantity/Location: As indicated on Drawings.

## E. Grab Bar

1. Mounting: Flanges with concealed fasteners
2. Material: Stainless steel, 0.05 inch thick
  - a. Finish: Smooth, No. 4, satin finish
3. Outside Diameter: 1-1/2 inches
4. Configuration and Length: As indicated on Drawings.
5. Quantity/Location: As indicated on Drawings.

## F. Vendor

1. Type: Sanitary napkin and tampon
2. Mounting: Surface mounted
3. Capacity: 20
4. Operation: Two coin (50 cents)
5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin)
6. Lockset: Tumbler type with separate lock and key for coin box
7. Quantity/Location: Provide one (1) per Women's Toilet Room. As indicated on Drawings.

## G. Sanitary-Napkin Disposal Unit

1. Mounting: Surface mounted
2. Door or Cover: Self-closing disposal-opening cover and hinged face panel with tumbler lockset
3. Receptacle: Removable
4. Material and Finish: Stainless steel, No. 4 finish (satin)
5. Quantity/Location: Provide one (1) per stall in Women's Toilet Room. As indicated on Drawings.

## H. Seat-Cover Dispenser

1. Mounting: Surface mounted
2. Minimum Capacity: 500 seat covers

3. Exposed Material and Finish: Stainless steel, No. 4 finish (satin)
4. Lockset: Tumbler type
5. Quantity/Location: Provide one (1) per stall. As indicated on Drawings.

I. Mirror Unit

1. Frame: Stainless-steel angle, 0.05 inch thick
  - a. Corners: Welded and ground smooth
2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
3. Size: As indicated on Drawings.
4. Quantity/Location: Provide one (1) per lavatory. As indicated on Drawings.

2.03 SHOWER ROOM ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation
5. General Accessory Manufacturing Co. (GAMCO)

B. Towel Hook

1. Description: No.8 polished stainless steel double towel hook
2. Mounting: Surface mounted. Secure mounting bracket to wall with concealed screws.
3. Location/Quantity: Provide one (1) per shower stall. As indicated on Drawings.

C. Liquid Soap Dispenser

1. Basis-of-Design Product: Bradley - Bradex Model
2. Description: Shelf Type Dispenser - Two Soap Valves
3. Mounting: Surface mounted
4. Material and Finish: Stainless steel, No. 4 finish (satin).

5. Location/Quantity: Provide one (1) per shower stall. As indicated on Drawings.

#### 2.04 WARM-AIR DRYERS

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Dryer, Inc.
3. American Specialties, Inc.
4. Bobrick Washroom Equipment, Inc.
5. Bradley Corporation
6. Excel Dryer Corporation
7. General Accessory Manufacturing Co. (GAMCO)
8. World Dryer Corporation

B. Description

1. Mounting: Surface mounted
2. Operation: Place hands 3-6 inches below nozzle to activate dryer.
  - a. Operation Time: Switch off delay of 2 seconds max. and 80 second timeout function.
3. Cover Material and Finish: Cast iron, with porcelain enamel finish in color selected by Architect.
4. Electrical Requirements: 115 V, 20 A, 2300 W.
5. Location/Quantity: As indicated on Drawings.

#### 2.05 UNDERLAVATORY GUARDS

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. TCI Products
3. Truebro, Inc.
4. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.

5. Material and Finish: Antimicrobial, molded-plastic, white
6. Location/Quantity: Provide one (1) per lavatory.

## 2.06 CUSTODIAL ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation
5. General Accessory Manufacturing Co. (GAMCO)

B. Utility Shelf

1. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
2. Size: 16 inches long by 6 inches deep.
3. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).
4. Location/Quantity: Provide one (1) per Janitor's Closet. As indicated on Drawings.

C. Mop and Broom Holder

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf
2. Length: 36 inches
3. Hooks: Three
4. Mop/Broom Holders: Four , spring-loaded, rubber hat, cam type
5. Material and Finish: Stainless steel, No. 4 finish (satin)
  - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel
  - b. Rod: Approximately 1/4-inch- diameter stainless steel
6. Location/Quantity: Provide one (1) per Janitor's Closet. As indicated on Drawings.

**D. Paper Towel (Roll) Dispenser**

1. Description: Lever-actuated mechanism permits controlled delivery of paper rolls in preset lengths per stroke
2. Mounting: Surface mounted
3. Minimum Capacity: 8-inch wide, 800-foot long roll
4. Material and Finish: Stainless steel, No. 4 finish (satin)
5. Lockset: Tumbler type
6. Location/Quantity: Provide one (1) per Janitor's Closet. As indicated on Drawings.

**E. Liquid-Soap Dispenser**

1. Description: Designed for dispensing soap in liquid or lotion form
2. Mounting: Vertically oriented, surface mounted
3. Capacity: 80 oz.
4. Materials: Stainless steel, No. 4 finish (satin)
5. Lockset: Tumbler type
6. Refill Indicator: Window type
7. Location/Quantity: Provide one (1) per Janitor's Closet. As indicated on Drawings.

**2.07 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Owner's representative.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 10881**  
**VEHICLE SCALES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Vehicle scales shall include weighbridges, load cells, scale control units, junction boxes, cabling, embedments, and all necessary appurtenances required for a complete installation.
- B. Vehicle scales will be used to weigh sanitation trucks entering and leaving the station.
- C. Products supplied but not installed under this section:
  - 1. Embedments: Pit coping, foundation bolts, nuts, checking plates, checking bolts, and other embedments required for the vehicle scales. Embedments shall meet the requirements of, and be installed under, Section 05500 - Metal Fabrications.
  - 2. Cable: The cable between the pit power supply and the scale control unit. The cable shall meet the requirements of, and shall be installed under, Section 16121 - Wires and Cables - 600 Volts and Below.
- D. Products installed but not supplied under this section:
  - 1. Driver Interface Panels: Supplied by others as part of the scale data management system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03200 - Concrete Reinforcement
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 05500 - Metal Fabrications
- D. Section 09912 - Painting
- E. Section 16055 - Electrical Requirements for Shop-Assembled Equipment

**1.03 SYSTEM DESCRIPTION**

- A. Scale Performance Requirements
  - 1. Truck Design Criteria
    - a. GVWR: 78,000 lbs
    - b. GAWR (front): 20,000 lbs
    - c. GAWR (tandem rear axles): 58,000 lbs

2. Average Loading Frequency: Up to 320 trucks per day during two eight-hour shifts
  3. Peak Loading Frequency: Up to 30 trucks per hour at peak delivery times.
- B. Design scales in accordance with Section 16055 - Electrical Requirements for Shop-Assembled Equipment of the Electrical Contract.

#### 1.04 SUBMITTALS

- A. Contractor shall submit working drawings, shop drawings, and material specifications for the approval of the Engineer in accordance with Section 01300 – Shop Drawings.
- B. Shop Drawings
1. Product information for all equipment
    - a. Manufacturer's product name and model number
    - b. Manufacturer's standard catalog product data
    - c. Manufacturer's specification data
    - d. Description of construction features
    - e. Performance and operation data
    - f. Installation and mounting details, instructions and recommendations
    - g. Service and calibration requirements
    - h. Dimensions
  2. Arrangement and erection drawings of the equipment and controls
  3. Schematic control diagrams
  4. Electrical connection diagrams
  5. Complete description of the control systems
- C. Provide Operation and Maintenance manuals in accordance with Section 01831 – Operation and Maintenance Manuals.

#### 1.05 QUALITY ASSURANCE

- A. General: The manufacturer shall have ISO 9001 certification or shall maintain a quality assurance program verified by a third party inspection agency.
- B. Reference Standards
1. The following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern

nomenclature; and define parameters of configuration and construction, in addition to specific details in this specification:

- a. AASHTO, American Association of State Highway and Transportation Officials
- b. NCWM, National Conference on Weights and Measures
- c. NIST, National Institute of Standards and Technology
- d. NTEP, National Type Evaluation Program

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle all products and materials as specified in Section 01651 - Transportation and Handling of Material and Equipment, and Section 01661 - Protection of Material and Equipment.
- B. Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting the requirements of the approved shop drawings.
- C. Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Protect from harm in accordance with the manufacturer's recommendations.

#### 1.07 PROJECT CONDITIONS

- A. Project Environmental Requirements: Design and construct the system for continuous operation under the following temperature and humidity conditions:
  - 1. Control Rooms
    - a. Air conditioned and heated
    - b. Ambient Temperature: Normal range is 65 to 80 degrees F
    - c. Relative Humidity: Normal range is 40 to 60 percent
  - 2. Indoor locations
    - a. Tipping Floor: Similar to outdoor locations
  - 3. Outdoor locations
    - a. Ambient Temperature: -10 to 120 degrees F
    - b. Relative Humidity: 100 percent maximum

4. Where required, provide thermal enclosures equipped with thermostatically controlled space heaters.

## 1.08 MAINTENANCE

### A. Spare Parts

1. Provide spare part in accordance with Section 01750 - Spare Parts and Maintenance Materials.
2. Furnish and deliver spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification Section.
3. The following shall constitute the minimum spare parts:
  - a. All standard recommended spare parts, as indicated in the equipment manufacturer's instructions manual for each component of the system.
  - b. Furnish the following complete spare units:
    - (1) Two load cells of each type supplied
    - (2) One dozen of each type and size of fuse used

- B. Warranty: Load cells shall have a five year warranty against failure of all types, including defects in material and workmanship, lightning and surge voltage, water damage and corrosion. The warranty shall cover all costs associated with replacement parts, travel, mileage, and on-site labor.

- C. Maintenance Service: The Contractor shall provide, at no additional cost to the City, a one-year service agreement from the manufacturer of the vehicle scale system, under which, at a minimum, the manufacturer shall inspect, calibrate, check and report to the City on the system every three months. The inspection shall include all equipment provided as part of the system, and shall include witnessing of in-service operation.

## PART 2 PRODUCTS

### 2.01 WEIGHBRIDGE

- A. Maximum Capacity: 100 tons
- B. Scale Accuracy: Plus or minus 0.1 %
- C. Type: Fully electronic. Mechanical weighing elements, check rods or check stays are prohibited.

- D. Nominal Size: Clear and unobstructed weighing surface of 30-feet long and 10-feet wide.
- E. Deck Surface
  - 1. Field-placed concrete, 4500 psi, at least 6-inches thick.
  - 2. Steel bottom liner for deck pan.
  - 3. Provide full size reinforcing mat. Concrete reinforcement shall be epoxy coated in accordance with Section 03200 - Concrete Reinforcement.
  - 4. Meet the requirements of Section 03300 - Cast-in-Place Concrete.
- F. Number of Sections: Two
- G. Capacity: Dual tandem axle (4-foot centers) loading of at least 70,000 lbs.
- H. Construction
  - 1. Heavy duty. Maximum deflection at rated DTAC shall not exceed 1/900.
  - 2. Modular construction.
  - 3. Protected with one coat of epoxy ester paint, applied to a minimum thickness of 3 mils.
- I. Checking: Bumper plate.
- J. Manholes: Provide where shown.
  - 1. Quantity: Two
  - 2. Size: 2-foot diameter
  - 3. Location: Approximate center of each section.
- K. Access: Complete top access to load cells via access openings in the weighbridge.
- L. Painting
  - 1. Meet the requirements of Section 09912 - Painting as modified herein.
  - 2. Clean steel to SSPC-SP6 finish.
  - 3. Apply two coats of epoxy-modified alloyed enamel.
  - 4. Total dry thickness: 6 mils

## M. Manufacturers

1. Fairbanks Scale
2. Cardinal Scale
3. Or approved equal

## 2.02 LOAD CELLS

- A. Type: Rocker column or double-end beam cell
- B. Materials of Construction: Stainless steel
- C. Hermetically Sealed
- D. Enclosure Rating: NEMA 6P
- E. Cable: Stainless steel braided sheath or rigid and flexible steel conduit
- F. Provide pit-mounted sectional controllers, junction boxes and pit power supplies as required. Provide all cabling between pit-mounted devices.
- G. Furnish cable between pit-mounted equipment and scale control unit.
- H. Provide sufficient lengths of cabling for all devices and installations.
- I. Furnish sufficient length of all cabling

## 2.03 SCALE CONTROL UNIT

- A. The scale control unit shall receive the load cells output, and output the calculated weight.
- B. The unit shall have the capability to perform calibration, span, zero, and shift adjustment at the scale control unit. These functions shall not require work at the scale.
- C. Load Cell Capacity: Minimum of at least 16
- D. Memory
  1. Size: Minimum 64K, expandable to 320K
  2. Type: Battery backed (2-year battery life)
- E. Communication: Scale control unit shall be capable of communicating using each of the following:
  1. 4-20 mAdc

- 2. Serial communication
  - a. RS-485
  - b. RS-232 (4-wire)
  - c. RS-232 (9-pin)
- F. Accuracy: Plus or minus 0.01%
- G. Display
  - 1. Resolution: 10,000 divisions
  - 2. Character Size: 0.5 inch
  - 3. Update Rate: Programmable, 0.1 to 10 seconds
- H. Digital Diagnostics
  - 1. Fault detection of any individual load cell.
  - 2. Identification of the failed cell.
  - 3. Capability to predict future cell failure.
- I. Mounting: Wall
- J. Power: 120 Vac
- K. Certification: NTEP
- L. Manufacturers
  - 1. Fairbanks Scale 2500 Series with Intalogix Technology
  - 2. Mettler Toledo Jaguar
  - 3. Or approved equal

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Interface with Other Work
  - 1. The weighbridge and load cell assembly shall fit in the space indicated on the Contract Drawings. Coordinate to precisely locate and size load piers.
  - 2. The scale control unit shall interface with the scale data management system provided by others (PIN 82704RR00033). The unit shall interface over an RS232 communication link, sending weight information continuously, with a carriage return at the end of the string. Other communication settings shall be coordinated during construction.



### 3.02 FIELD QUALITY CONTROL

#### A. Field Testing

1. Provide field testing in accordance with Section 01811 - Preliminary and Final Field Tests.
2. System Checkout and Startup: The Contractor, under the supervision of the Supplier, and other suppliers as applicable, shall perform the following:
  - a. Check and approve the installation of all components and all cable and wiring connections between the various system components prior to placing the equipment into operation.
  - b. Conduct a complete system checkout and adjustment, including calibration, tuning, checking, and testing. When there are future operational functions included in this work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up.
  - c. Supplier shall certify the scale in accordance with New York State Bureau of Weights and Measures. Certification documentation shall be forwarded to the State and the DSNY.
  - d. The Contractor shall provide all test equipment necessary to perform the testing during system checkout and start-up.
  - e. The Contractor and Supplier shall be responsible for initial operation of the system and shall make any required changes, adjustment or replacements for operation and equipment necessary to perform the functions intended.
  - f. The Contractor shall furnish to the Engineer certified calibration reports.
  - g. The Contractor shall furnish the Engineer an installation inspection report certifying that all equipment has been installed correctly and is operating properly. Authorized representatives of both Contractor and the Supplier shall sign the report.

- B. Manufacturer's Field Services: The Contractor shall retain the services of the Supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

**Section 11010**  
**FALL RESTRAINT SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes the design, engineering, fabrication and installation of the fall restraint systems, as follows:
  - 1. Permanent steel tie-back/anchoring point assemblies (Type 1)
  - 2. Sliding lanyards, intermittent stabilizers, and cable system (Type 2)
  - 3. Components of this section required for completion of a complete fall restraint system including, but not limited to brackets, runners, locking runners, pre-tensioners, shock absorbers, intermediate supports, corner supports, swaged and swageless tensioners and end fittings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 - Structural Steel
- B. Section 05500 - Metal Fabrications
- C. Section 07610 - Sheet Metal Roofing
- D. Section 07920 - Exterior Joint Sealants

**1.03 SYSTEM DESCRIPTIONS**

- A. It is the intent of this specification to provide the design criteria which will provide for two separate types of fall arrest systems; that upon design, engineering, fabrication and installation will result in systems which will permit a safe means by which one can horizontally negotiate the building roof by means of a permanently fixed set of anchoring points (Type 1) by which a workman can secure his/her life safety line, and a proprietary cable and lanyard/lifeline systems (Type 2) by which a workman can negotiate the roof without ever uncoupling/disconnecting their life safety line.
- B. The Contractor shall provide the required engineering services associated with the fall arrest systems. Engineering services shall include the design, structural weldments, reactions and other such computations required to analyze the proposed systems and all its components.
  - 1. The structural computations and calculations and Drawings shall be signed and sealed by the engineer responsible for their preparation.

2. Include details of structural steel supports/stub columns and base plate assemblies, which are to be attached to the steel roof purlins, unless otherwise indicated.

C. Design Requirements

1. The equipment shall be designed by or under the direction of a Professional Engineer registered in the State of New York. Equipment not manufactured domestically shall be subject to acceptance of the Professional Engineer registered in the State of New York.
2. Structural assemblies and components shall be designed with a safety factor of 4 to 1 against failure as a minimum based on ultimate strength and normal operating conditions, and be so certified. All stresses and deflections shall be limited in accordance with governing codes and regulations.
3. The fall arrest system (Type 2) located along the roof ridge and along each gutter shall incorporate intermediate supports which allow for the working/negotiating of roof areas without disconnecting the safety line.

1.04 QUALITY ASSURANCE

- A. Qualifications: The Contractor shall submit evidence which shall show successful experience in fall restraint systems, including not less than three (3) years continuous experience in the design, engineering, fabrication and installation of systems similar in scope any type to the work required for this project.

B. Codes and Standards

1. Design and erection shall comply with the current requirements or a specific variance granted therefrom, of all governing codes and regulatory agencies, including, but not limit to the following:
  - a. Occupational Safety and Health Act (OSHA)
  - b. American National Standards Institute (ANSI)
  - c. American Society of Mechanical Engineers (ASME): ASME A39.1, "Safety Requirements for Window Washers"
  - d. American Institute of Steel Construction (AISC)
  - e. AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings," including the "Commentary" thereto
  - f. AISC "Code of Standard Practice for Steel Buildings and Bridges", including the "Commentary" thereto

3.03 TRAINING

- A. Provide training as specified in Section 01821 – Start-up and Training.

-END OF SECTION-

NO TEXT ON THIS PAGE

- g. American Welding Society (AWS): AWS D1.1 "Structural Welding Code, Steel"
  - h. State and Local Building Codes and other authorities having jurisdiction in the Project location
- C. Permits, Inspections and Approvals: The Contractor shall apply, secure and maintain the necessary permits and approvals required by governing regulatory agencies.
  - 1. The work of this Section shall include obtaining and paying for any necessary inspection permits as required by the local and State inspection authorities and making such tests as are called for by the regulations of such authorities.
  - 2. Required tests shall be made in the presence of the authorized representative of such local authorities. A certificate of adequacy of the entire installation, and of the testing performed, shall be issued by the qualified Contractor.
- D. Coordination: The Contractor shall coordinate related work and surfaces to ensure successful completion of work specified in this section.
- E. Single-Source Responsibility: Subject to compliance with requirements, fall arrest systems (Type 1 & Type 2) shall be obtained from a single manufacturer.

#### 1.05 SUBMITTALS

- A. Shop Drawings: Before beginning fabrication of each different fall arrest system, provide detailed shop drawings of each different component of the proposed systems. Shop drawings shall clearly identify each component of the system; showing actual locations, positions, attachments, material sizes and configurations.
  - 1. Load Requirements: All loads imposed on the building structure shall be shown. The equipment shall be designed by, or under the direction of a Professional Engineer registered in jurisdiction of the Project location.
- B. Parts Catalogue: Listing replacement parts, including identifying numbers and ordering instructions.
- C. Operating and Maintenance Instruction Manuals
  - 1. Obtain and hand over three complete sets of operating and maintenance instructions for each item incorporated in the works.
- D. Lubrication charts shall be furnished, indicating all equipment lubrications points, the frequency of lubrication required, and type of lubricant for all equipment.

- E. Inspection Log: An inspection log shall be furnished to the City for the purpose of recording inspections.
- F. Instruction Plates: Drawings and metallic illustration plates which are to be printed or etched, of a non-corrosive material, to be supplied and installed on tie-back/anchoring posts. The posts shall also be provided with a name plate which includes the following ANSI/OSHA data:
  - 1. Name of Manufacturer
  - 2. Name or Number of Model
  - 3. Serial Number
  - 4. Maximum load which may be so suspended in pounds.
  - 5. Year of Manufacture
- G. Record Drawings: The Contractor shall submit, within six (6) weeks prior to the issue of the Certificate of Completion to the Commissioner, record drawings of the work comprising plans, sections and elevations to a scale of 1/8 and 1/4.
  - 1. Moment reaction at permanent supports, and other anchoring points.
  - 2. Reactions at anchors due to the intermittent stabilization tie-in devices.
  - 3. Catalog describing major items of equipment.
- H. Samples: Samples shall be submitted for approval, of any fall arrest equipment, hardware (bolts, inserts, mounting brackets, etc.), lanyards/cables and fittings to be permanently fixed to the building.
- I. Certification: Provide a written letter of certification, signed by the manufacturer, installer and the Contractors Engineer stating that the fall restraint systems have been successfully designed, fabricated and installed in accordance with the Contract Documents, and will perform in accordance with the intent of this design.

#### 1.06 WARRANTY

- A. Provide a one-year warranty against defects in material, workmanship, or installation for all components, providing for repair or replacement for a minimum period of one year, including material and labor.
- B. The following types of failure will be adjudged as defective work:
  - 1. Abnormal aging or deteriorating of materials
  - 2. Failure or defects in materials, workmanship or installation of all or any components of the exterior maintenance equipment

C. Warranty Service

1. Maintenance Contract: Submit a one-year maintenance contract to provide maintenance services four (4) times in one year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering fall restraint assemblies/systems that may be incorporated in the work include the following or an approved equal:
  1. Tractel Ltd. - Swingstage Division
  2. Pro-Bel Enterprises
  3. Spider; Div. of SafeWorks L.L.C.
  4. Or approved equal
- B. Basis-of-Design: The design for the fall restraint system (Type 2) is based upon the "Hands Free Horizontal Cable System" as designed/manufactured by Pro-Bel Enterprises Limited. Subject to compliance with requirements, provide the named fall restraint system or an equivalent system as acceptable to the Commissioner, by one of the specified manufacturers.

2.02 GENERAL REQUIREMENTS

- A. All exterior components shall be constructed of high strength stainless steel.
  1. Protect dissimilar metals from electrolytic (galvanic) action.
- B. Connectors shall be of non-corrosive stainless steel; alloys of the type acceptable to the Commissioner. All welds shall be made by certified welders and shall be examined by non-destructive testing.
- C. The surface finish of all stainless steel components, permanently fixed to the structure, shall be a bright (non-polished) 2B finish, unless otherwise directed by the Commissioner.
- D. Obtain mill test reports on stainless steel wire cables/lanyards.
- E. The material sizes and thickness shown on the drawings are for conceptual design purposes. The manufacturer shall provide the final design and detailing of the equipment.



## 2.03 COMPONENTS OF THE WORK

- A. The Contractor shall furnish and install each different fall arrest system in accordance with the approved Shop Drawings; and in accordance with the manufacturer's instructions and recommendations.

## 2.04 ATTACHMENT POINT FALL ARREST SYSTEM (TYPE 1)

- A. Provide an all stainless steel, vertical steel support post/base assemblies. Assemblies will be supplied and permanently mounted to the steel roof purlin/structure by means of full penetration welds. The assemblies will be accurately fabricated to accommodate the steel roof structure components indicated. Each support will be factory fitted with a continuous fully welded ring/hoop assembly of the size, strength and configuration indicated on the approved shop drawings. Ring/hoop assemblies shall be for the sole purpose of securing the worker's safety lines (attachment points) when negotiating the building's roof. All components of the fall arrest system including, but not limited to the mechanical fasteners, and other such hardware shall be fabricated from Type 316 stainless steel; with a bright (non-polished) 2B finish, unless otherwise directed by the Commissioner.

## 2.05 HANDS FREE HORIZONTAL FALL ARREST SYSTEM (TYPE 2)

- A. General: The fall arrest system will be supplied the system manufacturer's high performance, proprietary runners, shock absorbers, pretensioners, modular intermediate supports (including corners), and other such guide components adapted and modified for the projects specific conditions. Each component of the guides and fittings will be fabricated from Type 316 stainless steel.
- B. Cables and Lanyards: Provide cables and lanyards, complete with high strength ends, turnbuckles, tensioners and other fittings. Cables and lanyards shall be fabricated from a minimum of 5/16 inch diameter stainless steel (type 316) wire rope. Cables and lanyards shall be one-piece assemblies of the lengths required.
  - 1. Provide tie-in lanyards for intermittent stabilization of the suspension cables, complete with stainless steel quick connect devices for attachment to the building anchoring points and permanent steel support posts/hoop assemblies.

## 2.06 LIFE SAFETY LINES AND ACCESSORIES

- A. Provide 5/16 inch diameter, stainless steel wire rope life safety (static) lines; for the attachment of the lanyards from the worker's fall protection equipment. The static line shall be secured to structural members as indicated on the approved shop drawings.
  - 1. The connections shall be capable of sustaining a minimum of 5,000 pounds before failure. Rope clips shall not be used.

## 2.07 FINISHES

- A. Provide fall restraint systems which are entirely fabricated from Type 316 stainless steel; including, but not limited to system components, accessories and assemblies with an as fabricated or bright (non-polished) 2B finish as acceptable to the Commissioner.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Fall arrest systems shall be installed by, or under the direct field supervision of the equipment manufacturer.
- B. The Contractor shall examine all aspects of the construction and immediately call to the attention of the Commissioner any conditions detrimental to a proper installation. The Contractor shall immediately correct all problems.
- C. Provide fall arrest systems complete with all miscellaneous and accessory components in strict accordance with the approved shop drawings; and at such time when construction and finishing of adjoining systems will permit. Install systems in sufficient time to avoid delays to the construction process. Fall arrest systems shall be secured in place as indicated on the approved Shop Drawings.
  - 1. Install each component of the fall arrest systems with full penetrating welds. Welds shall be of the types, sizes and strengths indicated on the approved Shop Drawings. Refer to Section 05120 – Structural Steel for additional welding requirements.

### 3.02 FIELD QUALITY CONTROL

- A. After completion of the installation, conduct full live load tests in accord with applicable standards and requirements of authorities having jurisdiction.
- B. Conduct tests in presence of the Commissioner and/or The City of New York's Representative, and under maximum design live loading conditions at typical service drop positions.
- C. Repair or replace all components, and correct deficiencies observed during testing/demonstration. Retest systems as required by the Commissioner and/or The City of New York's Representative to assure compliance with the Contract Documents.
  - 1. Costs related to repairs/replacements and re-testing of systems as a result of system/component failures shall be borne solely by the Contractor.

3.03 OPERATOR'S TRAINING

- A. Provide specified operator's training to ensure the safe use of the fall arrest systems in accordance with the requirements of Section 01821 – Equipment Start-Up and Training.

-END OF SECTION-

## 3.02 FIELD TESTS

- A. Test the equipment to demonstrate the following:
  - 1. Equipment has not been damaged by transportation or installation.
  - 2. Equipment has been properly lubricated.
  - 3. Equipment is not overheating
  - 4. Equipment is free of overloading of any part
  - 5. Equipment has no electrical or mechanical defects
  - 6. Compliance with the performance and design parameters
  - 7. System operability under all control schemes
- B. A qualified manufacturer's representative shall perform a full operating test in the presence of Commissioner. Contractor shall furnish all labor, materials and equipment required for such test and shall correct any deficiencies noted.
- C. Defects: Promptly correct any defects in the equipment or failure to meet the requirements of the specifications.

## 3.03 START-UP SERVICES

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the pressure washing equipment manufacturer to inspect the installation of the pressure washing equipment, place it in operation, make any necessary adjustments and instruct the operating personnel in its operation and maintenance.

-END OF SECTION-

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pivoting stainless steel spray wand, a 25 degree power nozzle, and a 50 ft swiveling high-pressure hose.

## 2.02 MANUFACTURER

- A. The equipment covered by these specifications shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practice of the trade, and shall operate satisfactorily.
- B. Provide one of the following:
  - 1. Jenny Products, Inc., Somerset, Pa., Model No. E-2000-C
  - 2. Karcher, Duluth, GA, Model No. HDS 1195
  - 3. Or approved equal

## 2.03 PRESSURE WASHER UNIT

- A. Pump: The pump shall be a three piston, axial pump with stainless steel valves and pistons with ceramic sleeves.
- B. Accumulator: The pump shall be provided with an accumulator specially designed to absorb hydraulic shock and assure smooth, powerful, high impact spray.
- C. Heater: The heater shall be copper electric resistance wire wound within steel tubing. A thermostat shall be provided to prevent the coil from overheating. The heater shall operate on 480-volt, 3 phase, 60 hertz current and shall draw not more than 94 amperes.
- D. Controls
  - 1. Controls shall be panel mounted for simple and easy operation. Separate motor and heater switches shall be provided. An indicator light shall show when the heater is energized. A detergent metering valve shall control the amount of concentrated detergent solution used and a float valve shall be provided on the inlet of a contamination-proof water system. A heavy duty water pressure relief valve and drain valve shall be provided.
  - 2. A warning sign shall be provided on the panel stating that the unit is to be plugged into the electric circuit only when the room is adequately ventilated and when there is no evidence of the presence of explosive gases. The word WARNING shall be in red letters not less than 1-1/2 inches high.
- E. Motor: The electric motor shall be a minimum of 5 hp and shall meet the requirements of Section 16220, Electric Motors of the Contract. The electric motor shall be designed for 480-volt, 3-phase, 60-hertz operation and shall be of the

capacitor start induction type with built-in overload protection. 50 feet of electrical cord shall be provided.

- F. Wheel Kit: A hand operated wheel kit shall be provided to fit the washer with detergent solution tank and rubber tire, ball bearing wheels.
- G. Hose: Provide pressure washer with 50 feet of 3/8-inch I.D. hose with quick-coupling connection. Water inlet shall have a high capacity in-line strainer. Also provide a 100-foot extension hose, with quick-coupling end connections and a hose reel of sufficient capacity to hold the extension hose.
- H. Nozzle Control System: A nozzle control system shall be provided for the unit with a switch recessed in the gun handle which will permit the operator to stop restart the washer and select detergent spray or clear water rinse. The control system shall operate on a 24-volt circuit and a transformer shall be provided in each unit for operation of the system.
- I. Standard Accessories: Standard accessories furnished for the unit shall include 40 feet of cleaning hose, detergent inlet hose with strainer and coupling for attachment to the hose reel furnished under another section, one 40-degree stainless steel washing and rinsing gun tip, and one 7-1/2 degree stainless steel degreasing tip.

#### 2.04 MANUFACTURER'S SERVICES

- A. Furnish the services of a qualified manufacturer's service representative to make any necessary adjustments, observe and assist initial operations and field testing, and train the plant operations and maintenance staff in the care, operation and maintenance of the equipment.
- B. Provide training services in accordance with Section 01821 - Training.
- C. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, instructions and other pertinent information.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install pressure washing equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Section 01732 - Installation of Equipment.

**Section 11011**  
**PRESSURE WASHING EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall provide the labor, materials, equipment and supervision for the furnishing, testing and training of pressure washing equipment as specified herein. Locate the pressure washing equipment in the Maintenance Bay.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 01431 - Quality Assurance Inspection
- C. Section 01732 - Installation of Equipment
- D. Section 01750 - Spare Parts and Maintenance Materials
- E. Section 01821 - Training
- F. Section 01831 - Operation and Maintenance Manuals
- G. Section 16220 - Electric Motors

**1.03 QUALITY ASSURANCE**

- A. The pressure washing system shall be a single unit, completely factory-assembled, and furnished by a single supplier. Quality assurance shall be provided in accordance with Section 01431 – Quality Assurance Inspection.

**1.04 SUBMITTALS**

- A. Shop Drawings: Submit for approval the following:
  - 1. Equipment catalog cuts, specifications and data sheets identifying all materials used and methods of fabrication. Information submitted shall be in accordance with Section 01330 – Shop Drawings.
  - 2. Weights of all component parts, assembled weight of units and approximate total shipping weight
  - 3. List of spare parts
  - 4. List of special tools
  - 5. List of recommended lubricants
  - 6. Operation and maintenance manuals: Submit Operation and Maintenance (O & M) instructions for the Pressure Washing Equipment in accordance with Section 01831 - Operation and Maintenance Manuals.



**1.05 SPARE PARTS, TOOLS AND SUPPLIES**

- A. Contractor shall furnish all special tools necessary to service, disassemble, repair, and adjust the equipment.
- B. The Contractor shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in the General Requirements Section 01750 - Spare Parts and Maintenance Materials.

**1.06 DELIVERY, STORAGE AND HANDLING****A. Delivery of Materials and Equipment**

- 1. Equipment shall not be delivered to the project site until the time set forth in the approved construction schedule for delivery and installation. Equipment furnished with no requirement for permanent installation shall be delivered near the end of the construction period.

**B. Storage of Materials and Equipment**

- 1. Materials and equipment shall be delivered in original, undamaged packaging with manufacturer's labels and seals intact.
- 2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.
- 3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into the work

**PART 2 PRODUCTS****2.01 GENERAL**

- A. Contractor shall provide one portable cold/hot/steam electric high-pressure washer, capable of delivering water at 2000 psi. The washer shall consist of a pump powered by a direct drive electric motor, hose reel, hose, wheel kit with detergent solution tank, accumulator, nozzle control system, heater suction and discharge hose, motor, controls, electrical cord, and all accessories necessary for a complete system. System components shall be mounted on a heavy-duty welded steel frame with pneumatic wheels with ball bearings and wheel brakes.
- B. The pressure washer shall be designed to operate with 480 Vac/3-phase/60 Hz power supply. The pressure washer shall operate no less than 3.0 gallons/minute (GPM). The max water temperature shall be 175 degrees/285 degrees (Infinitely Variable). Standard accessories shall include an on/off trigger gun, a 40 inch

**Section 11140**  
**VEHICLE EXHAUST SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Section Includes: System consisting of Exhaust Extraction Hose Reel for Diesel Smoke Removal with high-pressure exhaust fan, high temperature flex duct and connection nozzle.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15071 - Vibration Control
- B. Section 16055 - Electrical Requirements for Shop-Assembled Equipment

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. AMCA - B - Construction for Spark Resistant Fans

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Submit catalog product data indicating dimensions, general assembly, specialties and accessories, weights, rated capacities, performance ratings, materials and finishes, controls, electrical requirements, and wiring diagrams.
- C. Shop Drawings: Submit shop drawings indicating components, assembly, equipment locations, dimensions, weights and loadings, required clearances, and location and size of field connections. Include layout drawings showing field location of hose reel, duct diameters and hanger details.
- D. Operations and Maintenance Manuals: Submit Operations and Maintenance Manuals as specified in Section 01831 including manufacturer's descriptive literature including installation and operation instructions, controls, accessories, maintenance and repair data, and parts lists.

**1.05 QUALITY ASSURANCE**

- A. General: Provide equipment from a company specializing in the design and manufacture of vehicle exhaust systems which has a minimum of three (3) years experience, and issues complete catalog data on these products.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.
- B. Shipping and Handling: Comply with the manufacturer's instructions for rigging, unloading and transportation of units.
- C. Storage and Protection: Store equipment in its original shipping crates or containers, with labeling in place until time of installation. Store equipment in clean, dry place and protect equipment from physical damage.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Plymovent Corp
  - 2. CAR-MON Products, Inc.

## 2.02 MATERIALS

- A. Remote Control Motor Operated Hose Reel Hose Storage System
  - 1. Model MER-1250-200+CB, or approved equal, for 8-inch diameter hose storage reel hose with 30 feet hose length
  - 2. Power Supply: 460 Vac, 3-phase
  - 3. Hose reel shall be provided with a 1/2 HP TEFC winch motor assembly with a 920 RPM operating speed.
  - 4. Provide a worm reduction gear (1:80 @ 15.3RPM).
  - 5. Hose uncoiling speed shall not exceed 1.2 feet per second.
  - 6. Winch motor assembly shall be housed in a completely sealed cabinet and attached directly to the hose reel.
  - 7. The switch operated electrical control assembly shall operate on a 460V, 3 phase voltage. Control voltage for limit switches shall be 24V.
  - 8. Switch operation shall allow for hose positioning from either the control panel or the pendant switch. Three micro-switches shall control the adjustment of the hose position. Each micro switch shall be adjustable through the use of

pegs located on the unibody screw gear. The upper limit switch shall have the ability to control the on/off mode of the exhaust fan and shall be routed through the fan's starter. Micro switches operated either through the hose or hose stop impact will not be allowed.

9. Control panel shall be supplied with all required circuitry to control the positioning of the hose, operate the fan, and have the ability to control air make-up dampers via 2 auxiliary contacts. The control box shall have a master power switch and UP and DOWN pushbuttons on the door. A motor overload relay and circuit breaker (for the drive motor) shall be included inside the drive box.
10. Provide fan starter Model ES-90 as manufactured by Plymovent, or approved equal, and mount it next to the control panel.
11. Provide an up/down pendant control transmitter for motor driven hose reel, independent of control panel.
12. The motor drive for the recoil system shall be a .37kW/ .5hp continuous duty (460V, 3-phase, 60 Hz), 90 degree, gear driven motor/gear box combination unit with build in adjustable limit switches for the up/down rotational limits. Plastic gears, chain drive and non-continuous duty drive systems are not acceptable.
13. The drive motor shall be bolted directly to the end frame of the hose reel and covered with painted steel.
14. The motor drive system shall be able to lift 110 lbs of hose/nozzle up and around the hose reel drum.
15. Include with each hose reel two plated steel U-bolts installed onto the drum. These U-bolts shall act as a hose guides to help the coiled hose wind evenly around the drum. Plastic tubing type hose guides are unacceptable.
16. Hose Reel Construction and Components
  - a. All steel components shall be electro zinc plated steel except for the hose storage drum end plates, which will be powder coated yellow.
  - b. Provide four angle clips, one at each corner for mounting reel to walls or building steel.
  - c. Provide two adjustable side support tie bars that both connect the side plates together and act as the hose stop bar. Field adjust locations of bar to match hose diameter used if required.

- d. Access slot in hose reel drum shall be covered with a sheet metal cover made from the same thickness steel as drum. Cover any exposed edges of drum access slot with a heavy molded trim channel that covers the entire edge.
- 17. Provide Exhaust Gas Hose of two types. For first 5 feet before safety disconnect use 1200 degree F rated hose with no sewn or glued seams. Construction shall be of double walled high temp fabric with special heat stabilizer and reinforced by stainless wire held together with Stainless Steel Helix. After safety disconnect, hose shall be 25 feet of 660 degree F rated polyamide high temperature non-silicone fabric held together with stainless steel helix.
  - 18. Provide Stacker-2 Exhaust Nozzle for diesel or gas operations including finger for rain caps and adjustable telescopic fiberglass lifting pole. Single nozzle with stainless steel cone and internal protection grid shall be designed to suit tail pipe up to 8-inch diameter for use in continuous high temperatures with 8-inch diameter flex.
  - 19. Provide high-pressure fan with metal wheel construction meeting AMCA-B requirements. Fan to be certified by AMCA testing labs for performance. Include round 10-inch inlet and 10-inch outlet connections and vibration mounts. Fan cabinet shall be made of sheet metal. Provide fan's wheel and cabinet protected inside and outside with factory applied protective coating. Supply fan bracket for wall mounting.
  - 20. Provide 8-inch Safety Disconnect unit of steel coupling halves with adjustable spring clips built to be reassembled if uncoupled by emergency separation.
  - 21. Provide On/Off control for fan with motor overload protection, push button on/off switch and running light.
  - 22. Protective Coating: Provide protective coating meeting the following requirements:
    - a. Air-Dried Phenolic Coating: Where an air-dried phenolic corrosion-resistant coating is required, thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer and at least two coats of Heresite, or approved equal, air-dry phenolic corrosion-resistant coating to obtain a minimum total dry film thickness of 4 to 6 mils.
    - b. Manufacturer Recommendation: Perform cleaning and coating procedures as specified and in accordance with the coating manufacturers published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. General: Examine vehicle exhaust system at the time of delivery for damaged or missing components. Do not proceed with installation of units until all items found defective have been corrected.

#### 3.02 INSTALLATION

- A. Install all units in accordance with manufacturer's instructions. Make all necessary adjustments to equipment to provide complete and satisfactory operation upon completion of installation.
- B. Connect to electrical service.
- C. Install fan on vibration isolation. Refer to Section 15071 - Vibration Control.

#### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide the services of a qualified representative of the manufacturer to inspect the installation of the vehicle exhaust system, certify that it meets the manufacturer's recommendations, and instruct the operating personnel in their operation and maintenance.

-END OF SECTION-

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**Section 11141**  
**DIESEL FUEL DISPENSING SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. A Diesel Fuel Dispensing System shall be provided to supply the waste processing equipment vehicles on the loading floor, maintenance equipment, and the emergency generator on the pier level with diesel fuel as needed.
- B. Contractor shall furnish and install an automatic remote fuel port, all single and double containment piping, a single product twin hose fuel dispenser with integral pumps and meters, 6000 gallon double wall fuel storage tank, fuel management system, leak and inventory control system, leak detection equipment, and all required trim for a complete and operational system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 – Shop Drawings
- B. Section 01431 – Quality Assurance Inspection
- C. Section 01651 – Transportation and Handling of Materials and Equipment
- D. Section 01661 – Protection of Materials and Equipment
- E. Section 01750 – Spare Parts and Maintenance Materials
- F. Section 01811 – Preliminary and Final Field Tests
- G. Section 01821 – Training
- H. Section 01831 – Operation and Maintenance Manuals
- I. Section 02505 – Leakage Tests
- J. Section 03300 – Cast-In-Place Concrete
- K. Section 10440 – Interior Signs
- L. Section 15052 – Steel and Stainless Steel Pipe
- M. Section 15060 – Hangers and Supports
- N. Section 15076 – Piping and Equipment Identification
- O. Section 15191 – Diesel Fuel Piping
- P. Section 16230 – Package Engine Generator
- Q. Section 17320 - SCADA System – Control Panels and Enclosures
- R. Section 17330 – SCADA System – Panel Mounted Instruments and Devices

**1.03 Governing Standards:**

- A. FDNY Rules
- B. NYC Fire Code
- C. NYC Mechanical Code
- D. UFC – Uniform Fire Code



- E. NFPA 30 - Flammable and Combustible Liquids Code
- F. NFPA 30A- Motor Fuel Dispensing Facilities and Repair Garages
- G. NFPA 31 – Installation of Oil-Burning Equipment
- H. NFPA 54 - National Fuel Gas Code
- I. NFPA 70 - National Electrical Code
- J. UL 87 - Power Operated Dispensing Devices for Petroleum Products
- K. UL 142 – Underwriters Laboratories (UL), Steel Above Ground Tanks for Flammable and Combustible Liquids
- L. UL 330 - Hose and Hose Assemblies for Dispensing Flammable and Combustible Liquids
- M. UL 842 – Underwriters Laboratories (UL) Standard for Valves for Flammable Fluids
- N. UL 2085 – Underwriters Laboratories Inc., 2 Hour Fire Rating's Standard for Insulated Aboveground Storage Tanks for Flammable and Combustible Liquids
- O. API Standards for Installation of Fuel Dispensers

#### 1.04 DESIGN REQUIREMENTS

##### A. General

1. Design a diesel fuel dispensing system including an automatic remote fuel port, double containment piping, transition sumps, dispenser with sump, leak detection, a fuel management system, leak and inventory control system and all other appurtenances required for a complete and operational system. Except where noted, all system components shall be compatible with diesel fuel, gasoline, 85% ethanol (E85), and biodiesel (B20).
2. Install this system with all appropriate valves and appurtenances for a complete and operational system.

##### B. Standards

1. Provide system that meets the above referenced codes and City of New York regulation requirements. Each component of the system shall be listed by an independent testing laboratory and shall bear labels showing appropriate conformance to aforementioned codes, regulations and Section 15076, Piping and Equipment Identification.

2. The diesel fuel dispensing system shall be compatible with the equipment requirements currently utilized by the Department of Sanitation for:
  - a. Receiving piping connections from service/supply trucks
  - b. Distribution of product to facility equipment.

C. Construction

1. The dispenser shall be compatible with an FRP sump below to accommodate a flanged, sealed, and bolted connection between the two components.
2. Piping shall be a double walled system per the requirements of Section 15191 – Diesel Fuel Piping. Piping shall be double wall between sumps and equipment. Piping shall be single wall within sumps and equipment where confines act as secondary containment and have provisions for leak detection.
3. Double containment piping located inside the MTS or above ground shall be encased in concrete and separate from any other piping system.
4. The Contractor shall supply appropriate electrical raceways to the dispenser and dispenser area. The internal and external electrical requirements for a fully operating dispenser system shall be provided by and wired by the dispenser manufacturer, including the connection between the fuel management panel and the telephone/SCADA local outlets.
5. The Contractor shall supply appropriate electrical raceways and wiring to the leak and inventory control system panel, allowing for the connection to the fuel management system and all system sensors.

1.05 SUBMITTALS

- A. Provide shop drawing in accordance with the General Conditions, Section 01330 – Shop Drawings and as specified herein.
- B. Submit shop drawings and accessory cut sheets for approval. The design drawings shall show principal dimensions, size, type and locations of all connections and fittings and locations of all options/accessories. Design drawings shall also include catalog cut sheets for associated accessory items and subassemblies. Shop drawings and accessory cut sheets shall be submitted together as a single submittal package. Items not submitted in the package shall be identified in the transmittal letter and a schedule provided detailing forthcoming submittals on remaining components.
- C. Submit copies of the system installation, operation and maintenance manual prior to delivery.

- D. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty in accordance with the General Conditions and Section 01831 – Operation and Maintenance Manuals.
- E. Submit UL files identifying each component as being UL listed and approved and the fuel compatibility of each. Listings and approvals from other independent testing laboratories are acceptable if not available from UL. Any items not approved by independent testing laboratories shall be clearly identified.
- F. Submit a spare parts list as specified in Section 01750 - Spare Parts and Maintenance Materials.

#### 1.06 SPARE PARTS

- A. The contractor shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in the General Conditions.
- B. The spare parts list shall include a current unit prices and sources of supply for each item.
- C. The following spare parts shall be provided:
  - 1. Twelve (12) replacement dispenser filters or one year's supply, whichever is greater
  - 2. One (1) of each of the following:
    - a. Hose break-away valve
    - b. Swivel
    - c. Dispensing hose
    - d. Hose retractor
    - e. Each type of nozzle and receiver
    - f. Submersible turbine pump
    - g. Line leak detector
    - h. Any additional item recommended by the manufacturer.

#### 1.07 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Section 01431 – Quality Assurance Inspection, and as stated below.
- B. The manufacturer shall have a minimum of three (3) years experience in producing specified equipment for commercial use.
- C. Contractor shall be a licensed NYC installer.

- D. The installer must have taken, if applicable, manufacturer's training courses on the installation of piping, leak detection, and tank management systems and meet the licensing requirements in the State of New York.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01651 - Transportation and Handling of Materials and Equipment and Section 01661 - Protection of Materials and Equipment.
- B. Care: Use every precaution to prevent damage to the equipment during transportation and delivery to the site. Take extreme care in loading and unloading equipment and accessories.
  - 1. Do not allow the equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
  - 2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.
- C. Delivery: Ship all equipment complete, with minimal or no field assembly or fabrication required.

#### 1.09 WARRANTY

- A. System warranty shall be in conformance with Article 24 - Maintenance and Guaranty of the Standard Construction Contract.
- B. Diesel Fuel Piping shall have a lifetime warranty against faulty workmanship or materials. Defective product shall be replaced free of charge including shipping charges.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Equivalent products of other manufacturers may be submitted for approval.
  - 1. Dispenser
    - a. Gasboy
    - b. Dresser Wayne
    - c. Or Approved Equal

2. Containment Sumps
  - a. Bravo
  - b. OPW
  - c. Fibrelite
  - d. Or Approved Equal
3. Leak and Inventory Control and Management Systems
  - a. Veeder-Root
  - b. Gasboy
  - c. Or Approved Equal
4. Fuel Port
  - a. Simplex, Inc.
  - b. Or Approved Equal
5. Tank
  - a. Convault
  - b. Highland
  - c. Modern Welding
  - d. Or Approved Equal
6. Accessories
  - a. Red Jacket
  - b. FE Petro
  - c. Gasboy
  - d. EBW
  - e. Simplex, Inc.
  - f. Veeder-Root
  - g. Adel-Wiggins
  - h. OPW
  - i. Dresser Wayne

## 2.02 AUTOMATIC REMOTE FUEL PORT

### A. General

1. Automatic remote fuel port shall be designed to contain fuel spillage during truck fueling operations.
2. Connections shall consist of two (2) cam-lock couplings accessible from inside the fuel port cabinet. One coupling shall be used to supply fuel to the

emergency generator tank; the other coupling shall be used to supply fuel to the fuel storage tank. A single common coupling is not acceptable.

3. Connections and all other appurtenances shall be compatible with the fuel truck per Section 11563 - Fuel Tank Truck.
4. Fill lines shall transport product to either the dispenser or the emergency generator.
5. The automatic remote fuel port shall be mounted to an equipment pad as shown on contract drawings.
6. Automatic remote fuel port shall have both visual and audible alarms to alert operator when tank being filled is at the 90% level and lockout filling operations at the 95% level.

**B. Automatic Remote Fuel Port Features**

1. Weatherproof with lockable hinged doors and be capable of 20 gallon spill containment.
2. Two cam-lock quick disconnect coupling with dust cap and integral angle check valve.
3. External ground stud for connection to earth ground for attachment of delivery truck ground cable.
4. Pre-piped before installation.
5. Manual ball, shutoff valves for each line per Section 15112 - Valves Smaller than 4 Inches.
6. One (1) gpm hand pump for spill removal from containment, with shutoff and check valve.
7. Tank level indicator with 90% full alarm and lockout at 95% full.

**C. Construction**

1. All 316L stainless steel construction
2. Piping shall exit from the back of the cabinet
3. Integral flanges for pad mounting

## 2.03 DISPENSER

## A. General

1. The dispenser shall be a single product, twin hose type with a breakaway and swivel on each dispensing hose. The dispenser shall be compatible with diesel fuel, gasoline, 85% ethanol (E85) and biodiesel (B20) and include provisions for a bolted, sealed, flanged connection to the containment sump.
2. Dispenser shall have a maximum Working Pressure of 50 psi and a maximum flow rating of 22 gpm.
3. Dispenser shall use remote pumps located at the fuel storage tank.
4. Approvals – UL Listed. FCC sealable by U.S. Weight and Measures for the resale of fuel for applications involving the contracted periodic billing of the fuel dispensed.
5. Dispenser shall be placarded in accordance with all applicable codes and laws and conform to Section 10440 - Interior Signs.

## B. Dispenser Features

1. Registers: Volume only (gallons) displays. Display shall be back-lighted. Maximum 999.000 gallons.
2. Totalizer – Non-resettable accumulative totalizer. Reads up to 999999.
3. Pulser – 10:1
4. Meter – A minimum of two piston, nickel-plated aluminum with stainless steel sleeves and Teflon piston cups, positive displacement. Tested and calibrated for accuracy at any speed or pressure.
5. Voltage – Electronic register: 230VAC, 60 Hz.
6. DC Conduit – DC conduit and junction box in lower cabinet for wiring connections to fuel control systems.
7. Filter Kits – will be internal and must be upstream of valve and meter, shall be one micron and 85% ethanol rated.
8. Diesel hoses shall be hard wall, furnished with breakaway connections and swivels.
9. Emergency shear valves in fill line at the dispenser sump.

10. For additional dispensing system accessory components see subsection 2.08, Accessories.

C. Construction

1. Frame shall be G90 galvanized, heavy duty 13 gauge or greater. Side and Top Panels shall be stainless steel for rust resistance and replaceable. Access door shall be API Color Coded, fully removable, and furnished with thirty-six inch (36") Agency Logo. Hinges on access door shall not be acceptable.
2. Cabinet shall have approximate Dimensions of 53 3/4"H X 28 1/2"W X 18 1/2"D.

2.04 FUEL STORAGE TANK

A. General

1. Provide one (1) NYC approved aboveground storage tank, as shown, and as specified herein. Tank storage volume shall be 6000 gallons and shall be designed for aboveground storage of flammable and combustible liquids at atmospheric pressure.
2. Tank shall include emergency vents, normal vents, level gauge, overfill containment, overfill valve, vent riser pipe, sensors, pump containment box, and all other appurtenances for a complete system.
3. Tank shall be approved for listed and approved by an independent testing laboratory and shall comply with UFC, NYC standards and have COA and MEA numbers.
4. The tank including all accessories shall be installed in strict accordance with the manufacturer's recommendations and applicable fire and environmental codes.
5. Stairs shall be provided by the tank manufacturer to grant access to the top of the tank for maintenance and inspection. Stairs shall be located at the end nearest the fill box for ease of manual filling of the tank.
6. Tank shall be designed and tested to provide two (2) hour fire protection for the primary tank.

B. Tank Features

1. Pump Containment Box
2. Emergency shutoff switch
3. Seven (7) gallon spill containment fill box



4. Tank level and leak detection sensors
5. Access Stairs

C. Construction

1. Tanks shall be double wall in design and tested at 20 psi primary tank pressure and 5 psi secondary tank pressure.
2. Secondary tank shall be a steel tank. A two (2) inch monitoring tube shall be located between the primary and secondary tank.
3. All steel exterior to the concrete encasement shall be anti-oxidant powder coated to inhibit corrosion and meet ASTM B117.
4. Tank shall include a pump containment box to house turbine pumps, valves, and all other pump related appurtenances. The containment box shall be manufactured as an integral part of the primary tank and shall have provisions to seal and terminate secondary containment pipe within the box. Piping annular space shall drain into the confines of the box. Containment box shall have an anti-oxidant powder coated finish to inhibit rust.
5. The tank shall include a UL listed 7 gallon spill/overflow container manufactured as an integral part of the primary tank, surrounding the manual fill pipe, providing a 2 hour fire rating. The spill/overflow container shall include a stick port and normally closed valve to release spilled product into the main tank. Exterior steel shall be anti-oxidant powder coated to inhibit rust.
6. Tank shall include a two (2) inch atmospheric vent and emergency venting in accordance with NFPA 30.
7. Tank shall be electrically grounded in accordance with NFPA 78.
8. Tank shall be secured to the pad in accordance to applicable codes and per manufacturer's recommendations.

2.05 CONTAINMENT SUMPS

A. General

1. Containment sumps shall be furnished and installed at locations shown in Contract Drawings. Each sump shall be factory assembled, pre-piped, liquid tight and constructed of fiberglass reinforced polymer.
2. Containment sumps shall have provisions to seal and terminate secondary containment pipe within. Piping annular space shall drain into the confines of the sump.

3. Fuel oil extraction: In the event of a leak, the fuel oil shall be emptied from the sump by means of a vacuum truck and disposed of according to applicable city codes.
4. Containment sumps shall be listed and approved by an independent testing laboratory.
5. Containment sumps shall be equipped with leak detection equipment as specified herein.

**B. Dispenser Sump/Pan**

1. Shall provide access to and secondary containment of dispenser plumbing and breakaway and shear valves.
2. Shall be monitored with leak detection equipment.
3. Shall incorporate provisions for a flanged, sealed and bolted connection with the dispenser.
4. Contractor shall coordinate dispenser sump/pan with dispenser make/model and structure to ensure dispenser sump/pan is the proper size and depth.
5. Shall be listed and approved for use with gasoline including ethanol blends up to 85% (E85) and biodiesel blends up to 50% (B50).

**C. Transition Sumps**

1. Contractor shall provide transition sumps at locations shown to allow piping to transition from below ground to above. All shall provide access to and secondary containment of piping as shown. Transition sumps shall be monitored with leak detection equipment.
2. Transition sumps shall have a water tight diamond plate access cover capable of withstanding H20 axle loads.
3. Transition sumps shall incorporate provisions to support a pipe rack system. Pipe rack systems shall be provided where shown, specified or as needed to support above ground piping exiting transition sumps.
4. Positive concrete anchoring shall be incorporated as an integral part of the sump design.
5. Transition sumps shall include 2-inch rigid pipe fittings where pipes exit sump above the ground.

6. Transition sumps shall include above ground factory-sealed electric connections.

## 2.06 PIPING

- A. All piping shall be labeled in accordance to Section 15076, Piping and Equipment Identification.
- B. A vapor recovery line shall be installed from the fuel storage tank transition sump to the dispenser sump to accommodate potential future requirements for diesel fuel dispensing requiring venting. Both primary carrier and secondary containment ends shall be capped inside the sumps to prevent moisture contamination.
- C. Piping shall conform to Section 15052, Steel and Stainless Steel Pipe and Section 15191, Diesel Fuel Piping.
- D. Multiple Double containment pipes shall be separated three inches (3") wall to wall.
- E. Connections shall be made in accordance with manufacturer's recommendations and Section 15191, Diesel Fuel Piping.
- F. Pipe connections shall not be flanged.
- G. Piping shall slope toward tank s and sumps to allow any leakage captured by secondary containment pipe to drain back to leak detection equipment.
- H. Pipe Hangers and Supports: Pipe hangers and supports shall be provided and installed in accordance with Section 15060, Hangers and Supports, and Section 15191, Diesel Fuel Piping.

## 2.07 LEAK AND INVENTORY CONTROL AND FUEL MANAGEMENT SYSTEMS

### A. Leak and Inventory Control System

#### 1. General

- a. Provide a complete monitoring system to monitor fuel and fluid storage tanks, piping, containment sumps, emergency generator, automatic remote fuel port and related equipment as required and as specified herein. System shall include fuel monitoring panels, communication interface cards, sensors, probes, wiring, and all other appurtenances required for a complete and operable system.
- b. At a minimum the system shall monitor the following:
  - (1) Storage tank interstitial space for leakage

- (2) Storage tank liquid level
  - (3) Diesel fuel density
  - (4) Containment sumps for leakage; including pump enclosures, transition sumps, dispenser sumps/pans and as shown on contract drawings.
  - (5) Emergency generator tank interstitial space for leakage
  - (6) Emergency generator tank liquid level
  - (7) Emergency generator fuel consumption
  - c. System shall perform Business Inventory Reconciliation (BIR) and shall include all wiring, sensors, modules/cards, software, etc. required.
  - d. System shall include emergency generator applications.
2. Equipment
- a. Monitoring Panel:
    - (1) Shall be Veeder-Root model TLS-450 or approved equal.
    - (2) Shall be wall-mounted as shown in contract drawings.
    - (3) Shall be equipped to communicate with fuel management system.
    - (4) Contractor shall provide a minimum of one (1) monitoring panel and shall provide additional panels or card expansion bays if required to facilitate the number of required modules/cards.
    - (5) Shall include Total Access, Total Control, L2 Storage, Dual RS232 Module, and USB/Ethernet Dual Interface Module as standard features.
    - (6) Shall include AccuChart II/BIR EDIM to track all fuels and fluids that enter or exit each storage tank. System shall collect metered dispensing information from Fuel Management System and Fluid Dispensing System and shall provide accurate delivery and reconciliation reports.
    - (7) Shall include Universal Sensor/Probe Interface Modules, Universal I/O Modules or other modules/cards as required.

- (8) Shall include the following standard features/capabilities:
- (a) Comprehensive compliance reports
  - (b) Inventory and delivery monitoring and reporting
  - (c) Supports up to 32 probes
  - (d) Interstitial and sump monitoring capabilities
  - (e) Dispenser sump monitoring capabilities
  - (f) Audible and visual alarm capabilities
  - (g) Customizable alarms
  - (h) Email notification and reporting
  - (i) Fax notification and reporting
  - (j) Continuous statistical leak detection software capable of 0.2 GPH for both single and manifolded tanks.
  - (k) 3.0 GPH, 0.1 GPH and 0.2 GPH in tank leak detection
  - (l) 3.0 GPH, 0.1 GPH and 0.2 GPH line leak detection capabilities
  - (m) Sensor status reports
  - (n) Sensor status history reports
  - (o) 7.4-inch full VGA LCD touch screen
  - (p) High resolution, high speed 80 column thermal printer
  - (q) Universal compartments support universal sensor and probe module and input output interface module
  - (r) Built-in relay for overfill alarm
  - (s) Remote web access
  - (t) TLS-450 Direct Access software
  - (u) Up to nine (9) communication ports

- (v) Internal auto-dial fax modem communications SiteFax
- (w) Ethernet communications
- (x) RS-232 data communications
- (y) RS-485 data communications
- (z) USB port for software upgrade and data back up

b. Sensors, Probes, and Meters

- (1) System shall be connected to the emergency generator level and leak detection sensors.
- (2) Sensors, probes and meters shall be provided as shown, specified herein or as required for the leak and inventory control system to monitor the parameters described above and to perform BIR. All sensors, probes, and meters shall be listed and approved by an independent testing laboratory and shall be listed for the corresponding liquid type.
- (3) Storage tanks shall be equipped with magnetostrictive inventory probes capable of 0.1 GPM volumetric tank tightness testing as well as 0.2 GPH monthly and continuous testing.
- (4) Diesel fuel storage tank shall be equipped with magnetostrictive inventory probes compatible and equipped with float kits to monitor fuel density.
- (5) The emergency generator fuel supply line shall be equipped with a fuel flow meter or other means to measure generator fuel consumption for BIR.
- (6) System shall interface with the Fluid Dispensing System and monitor dispensing fluid volumes, incorporating data into BIR reports.

c. Overfill Alarm and Acknowledgement Device:

- (1) Each tank shall be equipped with an overfill alarm. Alarm shall be connected to an alarm relay in the system monitoring panel. System monitoring panel shall activate alarm when tank level reaches a preset level to warn of a potential tank bulk delivery overfill. Alarm trigger level shall be settable from the system monitoring panel. Alarm device shall include both audible and

visual alarms. Audible alarm shall be adjustable to have duration of 0 to 60 seconds and a noise level of 78 to 103 dB (at 10-feet).

- (2) Each overfill alarm shall include an acknowledgement device allowing delivery personnel to shut off audible alarm. Visual alarm shall remain illuminated until system monitoring panel prints an inventory increase report.
- (3) Overfill alarms and acknowledgement devices shall be located near fill port locations and by the waste oil disposal.

## B. Fuel Management System

### 1. General

- a. Provide a complete fuel management system capable of controlling dispensing operations of each dispensing hose to maintain 24-hour controlled access.
- b. The fuel management system shall include one (1) fuel island terminals, site controller, pump interface cards, fleet head office software and all other appurtenances for a complete and operable system. System shall be expandable for future expansions in the number of fuel sites, vehicles, drivers, dispensers, and nozzles.
- c. Access to product shall be restricted to personnel holding valid magnetic strip cards and who perform a two stage authorization process which shall include identification of both the driver and the vehicle.
- d. The system shall store transaction data as well as driver and vehicle records into its database using the internal FLASH disk. The electronic database shall also store fueling limits and restrictions determined by the City of New York for either driver or vehicle.
- e. Management system shall be listed and approved by a third party testing laboratory.
- f. Equipment shall be hardwired with rigid conduit between components, dispensers, pumps, and interconnections with other systems as shown on Contract Drawings.

### 2. Features

- a. Management System shall interface and communicate with the Leak and Inventory Control System to allow fuel management capabilities and Business Inventory Reconciliation (BIR). The system shall capture or

provide any necessary information to/from the Leak and Inventory Control System via TCP/IP communications port or RS-232 port.

- (1) At a minimum, the management system shall collect the following data from the Leak and Inventory Control System:
  - (a) 12:00 midnight shift inventory volume for tanks.
  - (b) Tank inventory level; CSLD (leak detection) status – Pass/Fail
  - (c) Fuel delivery information; water level.
  - (d) Water levels, temperature alarms (leak, overfill, sump, sensor, etc).
- (2) At a minimum, the management system shall provide the following data to the Leak and Inventory Control System:
  - (a) Fuel dispensed from each dispenser hose.
- b. The system shall include one (1) fuel island terminal with integrated site controller. Terminals shall communicate via CAT5 cable.
  - (1) Fuel island terminals shall include:
    - (a) LCD graphic display
    - (b) 16 metal piezoelectric keys
    - (c) Magnetic card reader
    - (d) Alphanumeric keypad
    - (e) Outdoor receipt printer with 1,000 ft paper roll including automatic paper cutter and alarms indicating low-paper and paper-out.
- c. The fuel island terminal integrated site controller shall have the following characteristics:
  - (1) Weather proof and water tight unit suitable for outdoor use.
  - (2) Capable of controlling up to 32 mechanical hoses and 64 electronic hoses at a single site.
  - (3) Shall communicate with dispenser via 485 pulse output.



- (4) Shall store up to 25,000 transactions and 50,000 vehicles/devices with the ability to set limitations and restrictions.
  - (5) Shall use a solid state flash disk and Real Time Clock (RTC) with backup, along with surge suppressors for transient and noise immunity.
  - (6) Shall support mechanical and electronic dispensers with all links protected and isolated.
- d. Site controller software shall be based on web server technology and enable easy secured (SSL) remote access through the network using a standard PC with an internet browser, without the need for any other software application. The browser interface shall allow control and monitoring, maintenance activities, report generations with advanced filters and templates, graphical monitoring of fuel levels, on-line pump monitoring, etc.
- e. The host computer shall collect the transactions and Leak and Inventory Control System information for centralized fuel management activities including required deliveries, forecasting and reconciliation. System shall consolidate data and generate reports including exception reports, reconciliation reports, trends, forecasts, consumption, tank capacity, etc and shall be capable of generating custom reports. The host software shall:
  - (1) Communicate with all sites to provide 24/7 on-line access through the network and shall support multiple fuel site controllers, fleet and departments (districts) and shall allow data consolidation.
  - (2) Use SSL security for its Web interface.
  - (3) Provide secure log-in through the Web for each fleet manager, for monitoring, control and report generation.
  - (4) Allow customizable vehicle and driver limits and restrictions including:
    - (a) Limit of daily, weekly and monthly refueling volume in gallons as well as in currency.
    - (b) Enable or disable vehicle refueling on specific days and/or specific time slots within a day
    - (c) Limit the maximum refueling session for a specific vehicle per transition, per day, week, or month.

- (d) Block specific station for a specific vehicle.
  - (e) Restriction of specific fuel types for refueling of a specific vehicle.
- 3. Provide a complete fuel management system to maintain 24 hour controlled access to fuel dispensing, activated by valid operator access card.
  - 4. Fuel management system shall be Gasboy Series 1000 Fuel Management System or approved equal.
  - 5. System shall be a two hose outlet, one card type.
  - 6. System shall prompt operator for a personal identification number (PIN), equipment identification, and hour meter entry.
  - 7. System shall limit amount of fuel dispensed to predetermined operator allocated amounts. Allocation shall be determined by DSNY.
  - 8. Management system shall be equipped to communicate with Leak and Inventory Control System.
  - 9. System shall be equipped with an internal modem for direct data transmission over phone lines.
  - 10. System shall include Gasboy MCE Plus magnetic card encoder or approved equal to allow for encoding of employee magnetic stripe cards.

## 2.08 ACCESSORIES

A. The following accessory components shall be furnished and installed.

- 1. Submersible Pumps
  - a. Provide two (2) submersible turbine pumps for the diesel fuel storage tank.
  - b. Pumps shall be listed and approved by an independent testing laboratory and shall be listed for use with diesel including biodiesel up to 20 percent (B20) and gasoline including ethanol blends up to 85 percent (E85).
  - c. Pumps shall be designed for class 1, group D hazardous locations
  - d. Pumps shall be 1-1/2 hp, 208-230 VAC, 60Hz, 1-phase.

- e. Provide line leak detection device and any accessory required which is compatible with the submersible turbine pump. Line leak detection device shall be compatible with ethanol blends up to 85 percent (E85). Contractor shall provide documentation from the manufacturer stating fuel compatibility.
- 2. High Hose Retrievers: High hose retrievers shall be provided for each dispensing hose. High hose retrievers shall be mounted on schedule 160 pipe, 10 feet above grade. Contractor shall provide all breakaways, swivels, whip hoses, and other accessories as shown or as required by code.
- 3. Emergency Shut-off Push Buttons: Emergency shut-off push buttons shall be located as shown and as required. Push buttons shall disconnect power to all dispensing devices, pumps, and all other electrical equipment in the fueling area. All push buttons shall be interconnected and require manual intervention to reset. Pushbuttons shall be suitable for use in class 1, group D hazardous locations.
- 4. Overfill prevention valves shall be provided for the aboveground diesel fuel storage tank and shall include drop tubes as shown on Contract Drawings or as required. Overfill prevention valves shall provide positive shut-off of product delivery during gravity filling or pressurized filling operations. Overfill prevention valves shall be designed for use in aboveground storage tanks and listed and approved by an independent testing laboratory.
- 5. Nozzles: The dispenser shall be equipped with a diesel fuel dispensing nozzle and high flow nozzle as specified herein.
  - a. One dispensing hose shall be equipped with a diesel/lead style fuel dispensing nozzle with the following characteristics:
    - (1) Spout retaining ring.
    - (2) Two-Stage lever.
    - (3) 50 psi maximum pressure
    - (4) Replaceable spout
    - (5) 1-inch NPT inlet
    - (6) Green hand insulator
    - (7) Capable of at least 10 gpm
  - b. One dispensing hose shall be equipped with a high-flow nozzle. High-flow nozzle shall be capable of dispensing at a rate of 18 gpm. High-flow nozzle shall be Wiggins ZZ9A1 or approved equal.
- 6. Signage
  - (1) Identification signs shall be provided and installed as shown, specified, as required by Code and by New York City regulations.

Signs shall also meet the requirements of Section 10440 – Interior Signs. Provide as a minimum the following:

- (a) In the remote fuel port, each connection port shall be clearly labeled with the appropriate identity, “DIESEL FUEL STORAGE TANK” and “GENERATOR DIESEL STORAGE TANK”.
- (b) Any required safety labels on the dispenser and in the dispensing area.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. All equipment and system components shall be installed in strict accordance with the most recent installation instructions provided by the manufacturer, NFPA, DEC Standards, local ordinance, recognized engineering procedure, and other applicable codes.
- B. Contractor shall be trained by manufacturer, the state, or other approved agency.
- C. All containment sumps shall be hydrostatically tested for leakage prior to concrete pour.

#### 3.02 TESTING

- A. System tests shall be according to manufacturer’s guidelines at time of installation.
- B. Manufacturer’s Services: The contractor shall retain the services of the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by him, the services of an authorized manufacturer’s representative to check the equipment installation and place the equipment in operation. The manufacturer’s representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
- C. A factory trained representative shall be present at the first tank filling and dispensing operation at the facility.
- D. Field Test: Provide field testing in accordance with Section 01811 - Preliminary and Final Field Tests.

#### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer’s Services: The Contractor shall retain the services of the Supplier to supervise and/or perform checkout and start-up of all system components. As part

of these services, the Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

- B. A factory trained representative shall be present at the first tank filling and dispensing operation at the facility.

### 3.04 TRAINING

- A. Provide training in accordance with Section 01821 – Start-Up and Training.
- B. The manufacturer of the fuel dispensing system shall include one day of on-site classroom and hands-on training at the facility. The day is one session of 8 hours.
  - 1. Maintenance: Training shall include operation of the system and regular maintenance (electrical, and mechanical). Additionally the City of New York key maintenance personnel shall be allowed to “shadow” the installation process whenever possible.
  - 2. Supervisors: Training shall include operation of the system and basic troubleshooting as a minimum.
  - 3. Operators Training: Operator training shall provide use skills along with safety training.

-END OF SECTION-

**Section 11142**  
**FLUID DISPENSING SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. A Fluid Dispensing System shall be provided to supply bulk motor oil and hydraulic fluid for use in the Maintenance Bay for servicing the facility's motorized equipment. A Waste Oil Collection system shall be provided for the collection of used fluids.
- B. Contractor shall furnish and install pumps, dispensing hose reels, dispensing nozzles, leak and level monitoring equipment, moisture separators, pressure regulators, pneumatic hoses, piping, waste oil drain receiver, valves, fittings, and accessories as shown, specified and required for a complete and fully operational system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01831 – Operation and Maintenance Manuals
- B. Section 02505 – Leakage Tests
- C. Section 09911 – Exterior Painting
- D. Section 10436 – Exterior Signs
- E. Section 10440 – Interior Signs
- F. Section 11141 – Diesel Fuel Dispensing System
- G. Section 11377 – Compressed Air Equipment
- H. Section 15052 – Steel and Stainless Steel Pipe
- I. Section 15060 – Hangers and Supports
- J. Section 15076 – Piping and Equipment Identification
- K. Section 17320 – SCADA System - Control Panels and Enclosures
- L. Section 17330 – SCADA System – Panel Mounted Instruments and Devices

**1.03 REFERENCES**

- A. FDNY Rules
- B. NYC Fire Code
- C. NYC Mechanical Code
- D. UFC – Uniform Fire Code
- E. UL – Power Operated Dispensing Devices for Petroleum Products
- F. NFPA 30 – Flammable and Combustible Liquids Code

- G. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages
- H. NFPA 31 – Installation of Oil-Burning Equipment
- I. UL-142, Underwriters Laboratories (UL) Steel Aboveground Tanks for Flammable and Combustible Liquids
- J. UL 842 – Underwriters Laboratories (UL) Standard for Valves for Flammable Fluids
- K. UL-2085, Underwriters Laboratories (UL) 2 Hour Fire Rating's Standard for Insulated Aboveground Storage Tanks for Flammable and Combustible Liquids
- L. NEW YORK CITY BUILDING DEPARTMENT requirements

#### 1.04 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Submit shop drawings and accessory cut sheets for approval. The design drawings shall show principal dimensions, size, capacities, performance, type, system pressures and locations of all connections and fittings and locations of all options/accessories. Design drawings shall also include catalog cut sheets for associated accessory items and subassemblies.
- C. Submit copies of the system installation, operation and maintenance manual prior to delivery.
- D. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty to the Commissioner at time of documentation completion.
- E. Shop Drawings: Submit working drawings, including arrangement and erection drawings of the piping, tanks, equipment and control equipment; schematic control diagrams; electrical connection diagrams; and complete description of the control system.
- F. Provide Operation and Maintenance (O & M) manuals in accordance with Section 01831 – Operation and Maintenance Manuals.

#### 1.05 SPARE PARTS

- A. The contractor shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in the General Conditions.

- B. The spare parts list shall include a current unit prices and sources of supply for each item.
- C. The following spare parts shall be provided:

<u>PART</u>	<u>QUANTITY</u>
1. Air Pump	1
2. Hose Reel	1
3. 50ft. of ½"ID Air Hose	2
4. Metering Nozzle	1 of each type

#### 1.06 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Section 01431 – Quality Assurance Inspection, and as stated below.
- B. The manufacturer shall have a minimum of three (3) years experience in producing specified equipment for commercial use.
- C. Contractor shall be a licensed NYC installer.
- D. The installer must have taken, if applicable, manufacturer's training courses on the installation of piping, leak detection, and tank management systems and meet the licensing requirements in the State of New York.
- E. All like components within the fluid system such as pump and pump controls, reels, hoses, valves, connectors, volume meters, etc., shall be the products of a single manufacturer.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Care: Use every precaution to prevent damage to the tanks during transportation and delivery to the site. Take extreme care in loading and unloading tanks and accessories. Do such work slowly with skids and suitable power equipment and keep tanks under control at all times.
- C. Do not allow the tank to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage. Lift tanks only by lifting lugs provided, never by chains or slings around the tank shell.
- D. If, in the process of transportation or handling, any tank is damaged, replace or repair such tank or tanks. Make all required repairs.



- E. Delivery: Ship each tank complete, with no field assembly or fabrication required.

## 1.08 WARRANTY

- A. The Warranty shall be in conformance with Article 24 – Maintenance and Guaranty of the Standard Construction Contract.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Equivalent products of other manufacturers may be submitted for approval.

- 1. Tanks

- a. Highland Tank
- b. Modern Welding Company
- c. ConVault
- d. Or approved equal

- 2. Lubrication Equipment

- a. Lincoln Industrial Corporation
- b. Graco, Inc.
- c. Or Approved Equal

- 3. Accessories

- a. Lincoln Industrial Corporation
- b. Graco, Inc.
- c. Morrison Bros. Co.
- d. Krueger Sentry Gauge Co., Inc.

### 2.02 FLUID STORAGE TANKS

- A. General

- 1. Furnish and install three (3), thermally insulated, double-wall steel aboveground storage tanks, as shown and specified herein. Each tank shall have a storage volume of 500 gallons. Tank shall fit the space provided.
- 2. The tanks shall be designed for aboveground storage of flammable and combustible liquids at atmospheric pressure and suitable for use outdoors. Tanks shall include integral steel secondary containment and thermal insulation that provides a minimum two-hour fire rating.

3. Tanks shall be supplied with emergency venting for the primary and the secondary containment tanks. Emergency venting by "form of construction" will not be permitted.
4. The tank system shall meet the requirements of the New York City Building Department and shall be so labeled.
5. Fluid storage tanks shall be monitored for leakage and level by the Leak and Inventory Control System as specified in Section 11141 – Diesel Fuel Dispensing System.

B. Construction

6. Lifting lugs shall be provided at balancing points to facilitate handling and installation.
7. As a minimum, the following threaded fittings with thread protectors shall be supplied with all fittings located on the tank top:
  - a. Two (2) 2 inch – NPT Interstitial Monitoring
  - b. One (1) 2-inch – NPT Normal Vent, Primary Tank
  - c. One (1) 4 inch – NPT Emergency Vent, Primary Tank
  - d. One (1) 4 inch – NPT Emergency Vent, Secondary Tank
  - e. One (1) 2 inch – NPT Product Fill
  - f. One (1) 4 inch - NPT Product Fill
  - g. One (1) 2 inch – NPT Product Pump/Supply
  - h. One (1) 2 inch – NPT Product Return/Auxiliary
  - i. One (1) 2 inch – NPT Liquid Level Gauge
  - j. One (1) 2 inch – NPT Level Switch
8. For additional Tank accessory components see subsection 2.04 Accessories.

2.03 FLUID DISPENSING EQUIPMENT

A. General:

1. Contractor shall provide motor oil and hydraulic oil dispensing systems which will dispense product in the maintenance bay at the locations shown on Contract Drawings. Each system shall store product in an aboveground storage tank. Systems shall be equipped with a wall mounted air powered oil pump, hose reels and nozzles as described below. Each pump shall include a dedicated regulator/dryer/lubricator and shall be connected to the building compressed air system. Each hose reel shall be outfitted with 50 ft of dispensing hose. Dispensing shall be controlled by a centrally located electronic dispensing control console fluid inventory control and management system as described below. Contractor shall supply all piping, hangers,

placards, containment sumps, vents, monitoring equipment, and other accessories for a complete and operational system.

2. Contractor shall provide a waste oil collection system allowing storage of waste product. System shall include an aboveground storage tank, a waste oil receiver located in the maintenance bay as shown on Contract Drawings, all single and double wall piping, tank monitoring equipment including a high level sensor and alarm, waste oil extraction port, stick ports, and all other accessories needed for a complete and operational system. Waste oil shall drain by gravity from the receivers in the maintenance bay to the storage tank. See Contract Drawings for receiver details.

## B. Construction

### 1. Pumps

- a. Contractor shall supply one (1) wall mounted positive displacement oil pump for each oil to be dispensed. Pump shall have a 6-inch pumping stroke and cycle on demand only.
- b. Pumps shall include a pneumatically operated 4-1/4 inch diameter air motor. Air motor and lower pump section shall be of an in-line design.
- c. Air Motor shall include a grounding lug and be equipped an external muffler operating below OSHA noise standards.
- d. Air Motor shall include a non-metallic poppet valve.
- e. Pump assembly shall have the following characteristics:

(1) Pump Ratio:	12:1
(2) Fluid outlet size:	3/4 inch NPTF
(3) Air inlet size:	1/2 inch NPT
- f. Contractor shall supply any accessory components required for proper pump operation including but not limited to thermal relief kit, wall mount bracket, low level cut-off kit, bleed type air shut-off valve, air filter/regulator/lubricator, automatic drain valve for filter, fluid shut-off valve, suction kit, run-away valve, etc.
- g. Pump shall include an integral air break automatic air shutoff to prevent a runaway condition

## 2. Hose Reel Assemblies

- a. Contractor shall supply wall mounted hose reels as indicated on Contract Drawings for motor oil and hydraulic oil. Reels shall have a minimum capacity of 50 feet of  $\frac{1}{2}$  inch ID hose.
- b. Reel construction: Reel base shall be a double pedestal design. The reel shall incorporate a fully ported hub, adjustable guide-arms supporting hose guides on both sides, and external swivel housing. The hose guide roller assembly shall be the full width of the spool.
- c. Hose reels shall have the following characteristics:
  - (1) Reel outlet :  $\frac{1}{2}$  inch NPSM
  - (2) Reel inlet:  $\frac{1}{2}$  inch NPSM
  - (3) Pressure rating (oil): 1,500 psi
- d. Contractor shall supply any accessory components required for proper reel operation including but not limited to hose inlet kit and fluid shut-off valve.
- e. Contractor shall supply a minimum of 50 feet of hose per reel so nozzle is reachable from the ground.

## 3. Dispensing Nozzles

- a. Motor oil and hydraulic oil dispensing systems shall be equipped with non-metered dispensing nozzles.
- b. Dispensing nozzles shall have a locking trigger for hands free operation.
- c. Nozzles shall include: valve handle, rigid nozzle wand, lockable trigger, inlet filter, and swivel.
- d. Dispensing nozzles shall have the following characteristics:
  - (1) Maximum Flow Rate: 5 gpm
  - (2) Maximum Operating Pressure: 1,015 psi
  - (3) Nozzle Inlet:  $\frac{1}{2}$  npt
  - (4) Outlet:  $\frac{1}{2}$  npt

## 4. Fluid Inventory Control And Management System:

- a. Contractor shall provide an operator programmable fluid inventory control and management system as described on contract drawings and as specified herein. System shall have a 32-fluid, 300-dispensing point, 200-user capacity and shall control dispensing of motor oil and

hydraulic oil. System shall include but not be limited to dispenser units, keypad, fluid shut-off solenoids with integral pulse meters, master air shut-off solenoid, ready light, fluid filters, check valves, pressure relief kit, thermal relief kit, wall mount brackets, software, communications interfaces and any signal and electrical wiring required for an complete and operable system.

- b. System Operation: The operator shall select the type of fluid, station, and quantity to be dispensed. The controller energizes respective air and fluid solenoid valves. A ready light adjacent to the dispensing station illuminates indicating the system is ready for dispensing. As fluid is dispensed, the pulse meter sends a signal to the controller corresponding to the amount of flow. When the designated amount of fluid has been dispensed, the controller de-energizes the solenoids preventing further dispensing.
- c. The fluid inventory control and management system shall interface with the leak and inventory control system as required by Section 11141 – Diesel Fuel Dispensing System. The interface shall allow the fluid inventory control and management system to capture tank inventory information and report dispensed volumes and any other parameter required by the leak and inventory control system to generate reports including Business Inventory Reconciliation (BIR).
- d. Contractor shall provide a desktop PC with flat-panel monitor, keyboard, optical mouse, operating system, and other required software for a complete and operable system. Computer shall be installed in the Foreman's Office and shall serve as the Fluid Dispensing Control System master PC. Computer shall be capable of running and include necessary accessories to run the fluid dispensing system software and have an Ethernet connection.
- e. Dispensing Unit shall be mounted on the hose reel support structure as shown on Contract Drawings. Dispensing units shall be hard wired to each other and all ancillary components with wires run within rigid conduit, wireless communication is not be acceptable. Dispensing units shall have the following characteristics:
  - (1) Input voltage: 90 to 240 VAC 50/60 Hz
  - (2) Solenoid Output Voltage: 24 VDC
  - (3) Power Cord: 7 ft
  - (4) Dispense Point Connections: 6
  - (5) Ethernet Connections: 4

- f. Keypads shall be mounted under each pair of dispensing reels as shown on Contract Drawings and shall have the following characteristics:

- |                                  |                        |
|----------------------------------|------------------------|
| (1) Input voltage:               | 90 to 264 VAC 50/60 Hz |
| (2) Power Cord:                  | 6 ft                   |
| (3) Parallel Port:               | 1                      |
| (4) Bar Code Scanner Connection: | 1                      |
| (5) Network Connection:          | 1                      |

- g. Fluid Shut-off Solenoid units shall include integral pulse meters and fluid filters. Fluid shut-off solenoids shall be mounted on the hose reel support structure as close to the hose reel as practical. Fluid shut-off solenoids shall have the following characteristics:

- |                             |                      |
|-----------------------------|----------------------|
| (1) Electrical Rating:      | 24 VDC, 17w, 0.7 amp |
| (2) Filter:                 | 150 Micron           |
| (3) Ready Light Connection: | 1                    |

- h. Ready lights shall be green LED and shall be direct surface mountable onto the hose reel. Ready lights shall have a NEMA 4X housing and a 3-foot cord.

- i. Master air solenoid shall be located with the fluid pumps as shown on Contract Drawings. The master air solenoid shall have the following characteristics:

- |                        |               |
|------------------------|---------------|
| (1) Electrical Rating: | 24 VDC, 1.8 w |
| (2) Inlet/Outlet:      | 3/4-inch NPT  |
| (3) Flow Factor:       | 9cv           |

## 5. Piping

- a. Piping shall be of size and type specified in section 15120 – Interior and Exposed Piping Schedule.
- b. Pipe hangers and supports shall be furnished and installed as required and in accordance with Section 15060 – Hangers and Supports.

## 2.04 ACCESSORIES

- A. Motor oil and hydraulic oil storage tanks shall be fitted with a 7.5 gallon overflow spill container. The spill container shall be of steel construction with a hinged lockable cover. The container and cover shall be powder coated white inside and out and shall be fitted with a push-type drain with an elastomer o-ring.

- B. Each tank shall be equipped with a direct reading tank gauge to provide at-a-glance reading of the tanks liquid level. The gauge shall be a swing-arm type gauge used for measuring all types of liquid levels.

C. Signage

1. Identification signs shall be furnished and installed as shown, specified, and as required by Code and by New York City Building Department regulations. Signs shall also meet the requirements of Section 10436 – Exterior Signs, and Section 10440 – Interior Signs. Provide, as a minimum, the following:

a. At Tanks: (Outside)

	<u>Quantity</u>	<u>Description</u>
(1)	2	MOTOR OIL (on tanks long side)
(2)	2	HYDRAULIC OIL (on tanks long side)
(3)	2	WASTE OIL (on tanks long side)
(4)	3	FLAMMABLE NO SMOKING OR OPEN FLAMES (on wall next to each tank)

b. In Maintenance Bay: (Inside)

(1)	1	MOTOR OIL (next to reel on wall)
(2)	1	HYDRAULIC OIL (next to reel on wall)
(3)	1	WASTE OIL DISPOSAL (on wall above waste oil receptor)
(4)	1	MOTOR OIL PUMP (on wall next to pump)
(5)	1	HYDRAULIC OIL PUMP (on wall next to pump)

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All equipment and system components shall be installed in strict accordance with the most recent installation instructions provided by the manufacturer, NFPA, local ordinance, recognized engineering procedure, and other applicable codes.
- B. Contractor shall be trained by manufacturer, the state, or other approved agency.

### 3.02 TESTING

- A. System tests shall be according to manufacturer's guidelines at time of installation.
- B. Manufacturer's Services: The contractor shall retain the services of the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not

manufactured by him, there services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

- C. A factory trained representative shall be present at the first tank filling and dispensing operation at the facility.
- D. All product piping shall be pressure tested prior to being put into service. Contractor shall plan field tests carefully and carry them out with all due precautions. Pressurizing equipment should be suited to the size of the system and the pressure required and shall be operated by qualified and experienced personnel only. Pressure sources shall be capable of approaching test pressure gradually. Use gauges with a full-scale reading of no more than twice the test pressure. Use reliable gauges calibrated against a dead weight tester zeroed for atmospheric pressure. Should gauge reading fail to remain stable, a soap solution shall be used to locate leakage.
- E. Field Test: Provide field testing in accordance with Section 01811 – Preliminary and Final Field Tests.
- F. Leakage tests shall be performed on all fluid dispensing piping carrying both air and fluids in accordance with Section 02505 – Leakage Tests.

### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Services: The Contractor shall retain the services of the Supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

### 3.04 TRAINING

- A. Provide training in accordance with Section 01821 – Start-Up and Training.
- B. The manufacturer of the Fluid Dispensing System shall include one day of on-site classroom and hands-on training at the station. The day is one session of 8 hours.
  - 1. Maintenance: (2 hours) of training shall be included. Training to include operation of the system and regular maintenance (electrical, pneumatic and mechanical). Additionally the City Of New York key maintenance personnel shall be allowed to "shadow" the installation process whenever possible. By "shadowing" the equipment installation, the highest level of practical knowledge can be obtained.



2. Supervisors: (2 hours) of training shall be included. Training shall include operation of the system and basic troubleshooting as a minimum.
3. Operators' Training: (4 hours) of on-site training shall be included. Operator training shall provide use skills along with safety training.

**-END OF SECTION-**

**Section 11211**  
**SERVICE WATER SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Service water system comprising the following:
  - 1. End suction pumps with motors
  - 2. Variable frequency drives
  - 3. System control panel
  - 4. Stainless steel system base
  - 5. Hydropneumatic tank
  - 6. Piping, tubing, fittings, valves and appurtenances
  - 7. System controls including all switches, gages and meters
  - 8. All other accessories required to produce a complete working system

**1.02 RELATED SPECIFICATIONS**

- A. Division 1 – General Requirements
- B. Section 09912 – Painting
- C. Section 15076 – Piping and Equipment Identification
- D. Section 16050 – Basic Electrical Materials and Methods
- E. Section 16055 – Electrical Requirements for Shop-Assembled Equipment
- F. Section 16491 – Control Components and Devices
- G. Section 17320 – Control Panels and Enclosures

**1.03 SUBMITTALS**

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Shop Drawings: Submit working drawings, including arrangement and erection drawings of the piping, equipment and control equipment; schematic control diagrams; electrical connection diagrams; and complete description of the control system.
- C. Provide manufacturer's data showing pump performance, motor horsepower, system pressures and other operational parameters.
- D. Operation and Maintenance: Submit operation and maintenance manuals for the service water equipment.

**1.04 SYSTEM DESCRIPTION**

- A. The service water system manufacturer shall provide a package type system with all equipment and component parts completely mounted and assembled on the skid, piped and pre-wired requiring only external power for operation. The skid mounted system shall be used to provide water to the hose bib locations in the marine transfer station. The hose bibs will be used to clean the floors in the marine transfer station after the municipal solid waste has been removed from the area.

**1.05 QUALITY ASSURANCE**

- A. The service water system manufacturer shall have a minimum of three (3) years experience and shall have service water systems in operation for at least two years.

**1.06 SPARE PARTS**

- A. Provide the following spare parts:
  - 1. One impeller
  - 2. One set of mechanical seals

**1.07 WARRANTY**

- A. The Warranty shall be in conformance with Article 24 – Maintenance and Guaranty of the Standard Construction Contract.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. Metropolitan Industries
  - 2. USEMCO

**2.02 MATERIALS**

- A. Provide three end suction type pumps for each service water system, each pump with rated capacity of not less than 100 gpm at total dynamic head of 130 feet. Provide pumps rated for continuous use. Provide overall efficiency at rated point of 60 percent. Provide pumps of bronze fitted construction. Provide flanged pump connections with 125 lb ANSI bolt patterns. Provide a casing with a tapped drain connection. Provide an enclosed type impeller. Provide John Crane Type 21 mechanical seals with carbon versus ceramic faces and stainless steel hardware. Directly connect pumps to AC motors of squirrel cage induction design. Design the motors to match the variable frequency drive control. Provide motors capable of

meeting all speeds from zero to maximum flow without exceeding the nameplate horsepower rating of the motor. Provide 7.5 horsepower, 3500 rpm, 3-phase, 60 hertz, 480-volt motors with a 1.15 service factor.

- B. Provide a hydropneumatic tank meeting the requirements of ASME code for Unfired Pressure Vessels. Design the tank for 125 psig maximum working pressure and test at 1.5 times the maximum working pressure. Perform the test after assembly, but before painting with all openings closed. Continue testing until all seams and joints have been demonstrated to be thoroughly tight. Furnish all necessary equipment, material and labor for conducting the test. Provide tank which has been stamped to show compliance with ASME code. Internally divide tanks into air compartment and water compartment by flexible diaphragm to prevent air and water from mixing. Provide diaphragms which flex but do not stretch or crease during drawdown or filling operations. Provide water compartment of adequate volume to provide minimum of 15 gallons of drawdown between 60 psig and 30 psig. Precharge air compartment with dry air to 60 psig at factory. Coat or line interior of tank so as to prevent rust and corrosion. Provide tank of welded construction and built of copper bearing steel 1/4-inch thick unless greater thickness is required by code. Do not exceed 30 inches in diameter and 7 feet in height for overall tank dimensions. Acceptable manufacturers for the hydropneumatic tanks are as follows:
1. Amtrol
  2. Wessels
- C. Mount the pumps, motors, control panel, and associated components for the service water system on a stainless steel skid equipped with vibration mounts and suitable for bolting to a concrete pad. Situate skid components to allow easy access for maintenance. Provide stainless steel construction for the skid chassis including all brackets, supports, screws and other components.
- D. Provide 4-inch suction and discharge headers and 3-inch intermediate piping constructed of steel. Provide Class 150 and Class 300 steel flanges conforming to ASTM A-105 and faced and drilled per ANSI B16.5.
- E. Provide butterfly valves conforming to AWWA C-504 for Class 150B. Construct valve bodies of cast iron per ASTM A126, Class B. Provide flanged valves of the short body design with 125 lb flanged ends faced and drilled per ANSI B16.1. Provide mechanical joint ends meeting the requirements of AWWA C110. Provide offset discs to allow an uninterrupted 360 degree seating edge. Construct the disc of cast iron per ASTM A-48. Construct the disc seating edge of 316 stainless steel.
- F. Provide check valves of the nonslam silent operating type with internal spring loading. Provide check valves of the wafer style designed for installation between ANSI B16.1 Class 125 or Class 250 iron flanges or ANSI 16.5 Class 150 or Class 300 steel flanges. Construct the valve body of ASTM A126 Class B cast iron.

Construct the seat and disc of ASTM B584 cast bronze. Construct the compression spring of stainless steel.

- G. Furnish and install pressure gauges at suction and discharge of each pump and on each hydropneumatic tank. Provide pressure gauges of ANSI Grade 2A "Process Gauges" having integral partition between the measuring element and window, and employing pressure relieving back. Provide gauges of bourdon tube actuated with case material of black finished cast aluminum, black phenolic, or polished stainless steel having a corrosion resistant ring and gasketed glass or acrylic window. Furnish pressure snubbers or liquid filled gauges as required to dampen pressure pulsations. Provide gauges for pumps with 4-1/2-inch dials with a pressure range of 30" Hg to 15 psig for suction and 0 to 100 psig for discharge. Provide gauges for hydropneumatic tanks with 6-inch dials with a pressure range of 0-125 psig. Equip gauges with gauge cocks.
- H. Provide variable torque, adjustable frequency drives (AFDs) to vary the speed of the end suction pumps in response to system requirements. Provide a NEMA 1 enclosure, UL listed, completely assembled and tested by the manufacturer. Provide separate motors and AFDs as specified.
- I. Provide a local control panel housed in a NEMA 250 Type 1 enclosure. Construct the enclosure of stainless steel. Provide the following operator controls and indicators:
  - 1. Pump Hand/Off/Auto selector switch
  - 2. Pump RUN pilot lights
  - 3. Pump FAIL pilot lights
  - 4. Low suction pressure alarm pilot light
  - 5. High system pressure alarm light
  - 6. Audible alarm device
  - 7. Alarm silence push-button

In "Off" status, system shuts off. In "Auto" status, the AFD responds to the preset signal from the pressure transducer. Arrange transducer to start lead pump at 30 psig and stop it at 70 psig, and start the lag pump at 25 psig and stop it at 65 psig. Arrange the transducer to stop pumps at increasing pressure of 80 psig. In "Hand" status, the AFD responds to the set-point controller to adjust system pressure.

- J. Furnish and install all small metal piping, valves and accessories as required for complete installation.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install equipment at locations in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on the proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1.
- C. Tests: After installation of the service water system equipment, controls and all appurtenances, subject the units to a field running test, as specified in Division 1, under actual operating conditions. Demonstrate that under all conditions of operation service water equipment:
  - 1. Has not been damaged by transportation or installation
  - 2. Has been properly installed
  - 3. Has no mechanical defects
  - 4. Is in proper alignment
  - 5. Has been properly connected
  - 6. Is free of overheating of any parts
  - 7. Is free of all objectionable vibration
  - 8. Is free of excessive noise
  - 9. Is free of overloading of any parts
  - 10. Operate as specified with control system

### 3.02 CLEANING AND PAINTING

- A. Paint service water equipment as specified in Section 09912 – Interior Painting of the Structures and Equipment Contract. Do not paint stainless steel components.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 11311**  
**OIL WATER SEPARATOR**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Provide oil-water separator as shown and specified per Contract Documents, including, but not limited to:
  - 1. Double wall, underground oil-water separator (OWS)
  - 2. Access manways, portals, risers, and covers
  - 3. Monitoring instrumentation floats and controls
  - 4. Ancillary electrical connections and equipment
  - 5. Vent piping and inlet/outlet piping connections
  - 6. Portable steel manual hand operated winch

**1.02 RELATED SPECIFICATIONS**

- A. Section 02316 - Excavation
- B. Section 02317 - Backfilling
- C. Section 02505 - Leakage Tests
- D. Section 05561 - Miscellaneous Metal Castings
- E. Section 16491 - Control Components and Devices
- F. Section 17101 - SCADA System - General Requirements
- G. Section 17320 - SCADA System - Control Panels and Enclosures

**1.03 REFERENCES**

- A. ANSI B 16.5 - Pipe Flanges and Flanged Fittings
- B. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- C. American Petroleum Institute (API) 421 - Monographs on Refinery Environment Control- Management of Water Discharges, Design and Operation of Oil-Water Separators
- D. NFPA Code 30 - Flammable and Combustible Liquids Code
- E. Steel Tank Institute - A100-U® External Corrosion Protection Specifications
- F. UL 58 - Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids
- G. UL 1746 - Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks



- H. UL 2215 - Outline of Investigation for Oil Water Separators
- I. New York City Department of Environmental Protection (NYCDEP)
- J. New York City Building Code

#### 1.04 DESIGN REQUIREMENTS

- A. Design separator for gravity separation of sand, grit, settleable solids, or semisolids, and free oils (hydrocarbons and other petroleum products) from wastewater associated with floor wash down operations, including floor wash down runoff, cleanup of hydrocarbon spills, and/or cleaning/maintenance operations.
- B. Provide separator designed for intermittent and variable flows of water, oil, or any combination of non-emulsified oil-water mixtures ranging from zero to 200 gal/min. Minimum separator retention time shall be 10 minutes. Operating temperatures of the influent oil in water mixture shall range from 40 degrees F. to 80 degrees F. The specific gravity of the oils at operating temperatures shall range from 0.71 to 0.92. The specific gravity of the fresh water at operating temperatures shall range from 1.00 to 1.03.
- C. The free oil and grease concentration in the effluent from the separator shall not exceed 15 mg/l (15 PPM). Design the separator in accordance with Stokes Law and the American Petroleum Institute Publication 421, "Monographs on Refinery Environmental Control - Management of Water Discharges; Design and Operation of Oil/Water Separators" to achieve the specified effluent quality.
- D. Provide separator meeting the requirements of Underwriters Laboratories, Inc (UL) 2215 and NFPA 30.
- E. Design the separator to withstand an internal load test of 5-psig air pressure with a 5:1 safety factor.
- F. Design separator to be buried in ground with 7 feet of overburden, the hole fully flooded, with a safety factor of 5:1 against general buckling. Tanks shall support accessory equipment without undue strain.
- G. Design separator to withstand surface H-20 axle loads when properly installed according to manufacturer's installation guidelines.

#### 1.05 SUBMITTALS

- A. Submit shop drawings and accessory cut sheets for formal approval by the Commissioner, and await written approval from the Commissioner prior to initiating OWS fabrication activities. The OWS design drawings shall show principal dimensions, size, type and location of all connections, and location of all options/accessories. Design drawings shall also include OWS and instrumentation

catalog cuts, and vendor cuts for associated accessory items and subassemblies used in OWS manufacture, including the leak detection system, corrosion protection system, and high level switch, and high level alarm, and control panel.

- B. Submit copies of the system installation, operation and maintenance manual prior to OWS delivery.
- C. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty to the Commissioner at time of documentation completion.

#### 1.06 QUALITY ASSURANCE

- A. Construct storage tank in compliance with specifications and dimensions listed herein, and as shown on Contract Drawings. Written approval from the Commissioner is required for any exceptions, changes, or modifications to the specifications. Provide materials specified or implied as being necessary to complete Work, unless specifically noted otherwise.
- B. OWS shall be standard product of manufacturer regularly engaged in production of large 2,000 gallons or more underground coalescing OWSs, having three (3) years minimum experience. Documentation certifying this experience must accompany the bid submittal. No subcontracting of tank fabrication shall be permitted.
- C. OWS shall be fabricated, inspected and tested for leakage before shipment from the factory in accordance with PART 2 of these specifications.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Handling of OWS shall be in strict accordance with manufacturer's recommendations to avoid damage to tank and accessories. OWS shall be moved by lifting lug only - chains or cables shall not be wrapped around tank.
- B. Protect tank and fittings from being scratched or otherwise damaged during delivery, storage and handling. Replace or repair materials damaged during transport.
- C. Provide temporary storage of OWS on site prior to installation - storage location shall be free of rocks and debris.
- D. Non-compliance with any of the specifications listed herein or variation from approved construction drawing details, including dimensional data, will be sufficient cause for rejection of OWS.

**1.08 WARRANTY**

- A. The manufacturer shall warrant its products to be free from defects in material and workmanship for a period of one year from the date of shipment. The warranty shall be limited to repair or replacement of the defective parts.

**1.09 SYSTEM START-UP**

- A. Upon completion of OWS installation, the Contractor shall startup and test piping, valves, and level and control instrumentation. The Contractor shall be responsible for calibration, adjustment and/or repair of system components as necessary for proper operation of system. Provide minimum 5-day notice to the Commissioner prior to system startup.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Acceptable manufacturers are listed below. Equivalent products of other manufacturers may be submitted for approval.

1. Highland Tank
2. Modern Welding Co., Inc.

**2.02 OIL WATER SEPARATOR**

- A. Provide a double-walled oil water separator (F-OWS-01) for below-ground installation, complete with all piping, accessories, and control panel. Separator shall be standard prefabricated, inclined parallel-corrugated plate, gravity displacement type unit with integral sediment/grit chamber and removable top covers. The oil water separator shall be a special purpose factory assembled unit which is a standard product of a manufacturer regularly engaged in the production of such equipment.
- B. Provide oil/water separator having a nominal volume of 2,000 gallons and a sediment/grit chamber having a volume of at least 500 gallons. The sizing of this oil/water separator is consistent with industry protocols for complying with the minimum federal spill and discharge regulations therefore a separator of smaller volume is not permissible.
- C. Separator shall be a cylindrical steel vessel intended for the separation and storage of flammable and combustible liquids. The separator shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions.
- D. Separator shall have an oil storage capacity equal to about 30% of the total vessel volume and an emergency oil spill capacity equal to 60% of the total vessel volume.

- E. Separator capacities, dimensions, construction, and thickness shall be in strict accordance with UL 58.
- F. Double Wall construction with 360 degree Steel Secondary Containment: The separator shall be double-walled with an interstitial space between the primary and secondary walls for containment of leaked product from the primary tank. The inner steel tank shall be completely contained within the outer steel tank, enclosing 100% of the tank volume. The space between the inner and outer steel walls shall be monitored with an approved electronic leak detection device through a pipe that extends vertically to the top of the tank from a small sump at the bottom. Tank construction using thin walled primary tank with external fiberglass jacket shall not be permissible.
- G. Separator shall be fabricated, inspected, and tested for leakage before shipment from the factory by manufacturer as a completely assembled vessel ready for installation.
- H. The separator shall be a pre-packaged, pre-engineered, ready to install unit consisting of:
  - 1. An 8-inch flanged influent connection (150 lbs. F.F.)
  - 2. An internal influent nozzle at the inlet end of the separator. Nozzle discharge to be located at the furthest diagonal point from the effluent discharge opening
  - 3. A Sediment Chamber to disperse flow and collect oily solids and sediments
  - 4. A sludge baffle to retain settleable solids and sediment and prevent them from entering the separation chamber
  - 5. An Oil/Water Separation Chamber containing a removable, inclined parallel corrugated plate coalescer, with removable corrugated plates sloped downward toward the sediment chamber
  - 6. An oil dam with effluent transfer pipes
  - 7. An effluent clearwell
  - 8. An internal effluent downcomer at the outlet end of the separator, to allow for discharge from the bottom of the effluent clearwell only
  - 9. An 8-inch flanged effluent connection (150 lbs. F.F.)
  - 10. Fittings for vent, interface/level sensor, waste oil pump-out, sampling, and gauge

11. Three (3) 24-inch diameter manways, UL approved, complete with bolt-on extension, cover, gasket, and bolts:
  - a. One manway shall be placed to provide access to the sediment chamber.
  - b. One manway shall be placed between the inlet and the parallel-corrugated plate coalescer to facilitate access into sediment chamber for solids removal.
  - c. One manway shall be placed between the parallel-corrugated plate coalescer and outlet to facilitate access into the oil water separation chamber for oil removal.
12. Lifting lugs at balancing points for handling and installation
13. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life
- I. Corrosion Protection: Provide a Corrosion Control System for the oil/water separator in strict accordance with UL 1746 and A100-U® External Corrosion Protection Specifications as applied by a licensee of the Steel Tank Institute. Manufacturer must be a licensee of Steel Tank Institute. The A100-U® Corrosion Protection System consists of:
  1. Isolation Spool Pieces
  2. Dielectric Isolation Gaskets and Bushings
  3. External surfaces commercial grit blast, coated 15 mils DFT heavy duty Polyurethane
  4. Cathodic Protection System using Zinc/Magnesium Anodes
  5. PPII Protection Prover
  6. 30-year Limited Warranty
- J. Internal Coatings and Linings: Provide separator with internal surfaces commercial grit blast and coated with heavy duty polyurethane.

## 2.03 ACCESSORIES

- A. Provide a hold-down straps anchored to an underlying concrete pad for securing the OWS in accordance with manufacturers' recommendations. Provide adjustable turnbuckles or other means of tensioning the hold-down straps. Provide either polyester straps or steel straps with neoprene rubber liners for electrical isolation and tank protection.

- B. Provide a portable hand operated steel winch for the removal of petroscreen coalescers.

## 2.04 OPERATION AND CONTROL

- A. General: Provide an audible and visual alarm system that indicates high oil level and high-high oil level (audible and visual) of oil storage in the oil/water separator and an audible and visual leak detection alarm system that indicates hydrocarbon and/or water in the interstice. Provide control components in accordance with Section 16491 – Control Components and Devices of the Electrical Contract. All alarm conditions shall be relayed to the transfer station SCADA system.
- B. Level Sensors: Provide liquid level controls consisting of UL listed, intrinsically safe sensor floats. Provide floats of corrosion-resistant material. Position float switches to activate warning alarms in the control panel as follows:
  - 1. High Level Oil - when oil/water interface reaches a point indicating that oil occupies 20% of OWS volume (or other volume as recommended by the OWS manufacturer)
  - 2. High-High Level Oil - when oil/water interface reaches a point indicating that oil occupies 43% of OWS volume (or other volume as recommended by the OWS manufacturer)
- C. Leak Monitoring System: Provide a leak detection probe to activate warning alarms in the Control Panel if hydrocarbons and/or water is detected in the interstice between the primary and secondary tank walls.
- D. Control Panel: Provide prewired, three (3) channel alarm/control panel in accordance with Section 17320 - SCADA System Control Panels and Enclosures. The control panel must interface with the transfer station SCADA system in accordance with Section 17101 – SCADA System General Requirements. Power to the control panel is to be 120 volt, single phase. Control Panel includes the following:
  - 1. UL approved, side-hinged NEMA 4X, gasketed, watertight, locking enclosure to be mounted on the exterior wall of the Transfer Station building.
  - 2. Alarm lights for each circuit:
    - a. High Level Oil
    - b. High-High Level Oil
    - c. Leak

3. Audible alarm for the following circuits:
  - a. High-High Level Oil
  - b. Leak
4. Alarm silencer
5. Auxiliary contacts for interface with building SCADA system to relay all alarm conditions as a single grouped "Trouble" alarm signal. Contacts shall be SPDT, rated at 5 A at 120 VAC. Include the following alarm conditions:
  - a. High oil level
  - b. High-high oil level
  - c. Leak detected

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: The Contractor shall have New York State approval for installation of underground petroleum bulk storage tanks, and shall install OWS in accordance with manufacturer's recommendations. Where a conflict exists between manufacturer's instructions and those listed herein, manufacturer's installation instructions shall take precedence, although the Contractor must notify the Commissioner of conflict and action(s) taken. The Contractor shall also comply with NYCDEP guidelines and the New York City Building Code
- B. Testing: Prior to installation, visually inspect and test the OWS at job site to confirm tank integrity. This is in addition to testing performed by manufacturer, and is to confirm that OWS was not damaged during transit. Perform an air pressure test in the presence of the Commissioner at an internal pneumatic pressure of 5 psig. Paint all joints, seams, and connections with a soap solution, and hold the test pressure without a leak for at least one hour. In the event of test failure, the Contractor is prohibited from performing any repairs. The OWS manufacturer must be contacted to provide repairs.
- C. Anchor Pad and Hold Down System: Install reinforced concrete anchor pad with embedded anchor bolts as shown on the Contract Drawings and in accordance with Section 03300 – Cast-in-Place Concrete. Provide a tank hold down system as specified and in accordance with manufacturer's recommendations.
- D. Excavation and Backfill: Perform excavation and backfill in accordance with Sections 02316 and 02317. Provide a minimum of 12" inches of pipe bedding material (conforming to the pipe bedding requirements in Section 02317 – Backfilling) between the underlying concrete pad and the OWS. Backfill the remainder of the excavation with select fill conforming to the requirements or Section 02317 – Backfilling.

- E. Piping and Accessories: install all piping connections and accessories, as specified or shown on Contract Drawings, in accordance with respective manufacturer's recommendations.
  - 1. Provide vents to atmosphere for the inlet, manways, and outlet. The manway vents can be manifolded together to one common vent line. Inlet and outlet vents must have separate, dedicated vent lines.
  - 2. Prior to installation of piping, inspect all openings to assure that the dielectric nylon bushings are in place. Where flanged openings have been used (i.e., for the OWS inlet and outlet), confirm the dielectric isolation with a continuity tester. Make any necessary repairs to assure that current does not pass across the dielectric flanges.
- F. Top Slab and Access Covers: Install reinforced concrete top slab as shown on the Contract Drawings and in accordance with Section 03300 – Cast in Place Concrete. Provide heavy duty, H-20 rated, metal access covers for the tank manways as shown on the Contract Drawings and in accordance with Section 05561 – Miscellaneous Metal Castings.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 11377**  
**COMPRESSED AIR EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Description of Work: Furnish and install a compressed air system with all Piping, accessories and appurtenances necessary for a complete installation. Locate the equipment in the Secure Storage Room of the Maintenance Bay and include one (1) air compressor unit, one (1) refrigerated air dryer, three (3) air tool stations, and three (3) hose reels each with air hose and filter, regulator, lubricator assembly wall mounted in the maintenance bay, as shown. This compressed air system shall also supply air to the Fluid Dispensing System as shown.

**1.02 RELATED SPECIFICATIONS**

- |    |               |   |  |
|----|---------------|---|--|
| A. | Section 01330 | - | Shop Drawing   |
| B. | Section 01431 | - | Quality Assurance Inspection                         |
| C. | Section 01732 | - | Installation of Equipment                            |
| D. | Section 01750 | - | Spare Parts and Maintenance Materials                |
| E. | Section 01811 | - | Preliminary and Final Field Tests                    |
| F. | Section 01821 | - | Training   |
| G. | Section 01831 | - | Operation and Maintenance Manuals                    |
| H. | Section 09912 | - | Interior Painting                                    |
| I. | Section 15076 | - | Piping and Equipment Identification                  |
| J. | Section 15112 | - | Valves Smaller Than 4 Inches                         |
| K. | Section 15052 | - | Steel And Stainless Steel Pipe                       |
| L. | Section 15060 | - | Hangers and Supports                                 |
| M. | Section 16055 | - | Electrical Requirements for Shop-Assembled Equipment |
| N. | Section 16220 | - | Electric Motors                                      |
| O. | Section 16445 | - | Motor Control Centers                                |

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
1. ASME Boiler and Pressure Vessel Code, Sec. VIII, Div 1 - Pressure Vessels
  2. ANSI B93.45 (NFPA T3.27.3) - Pneumatic Fluid Power - Compressed Air Dryers - Methods for Rating and Test
  3. AFBMA9-Load Ratings and Fatigue Life for Roller Bearings
  4. AFBMA11-Load Ratings and Fatigue Life for Ball Bearings

## 1.04 SYSTEM DESCRIPTION

- A. Compressor Unit: Supply a splash lube-tank mounted reciprocating air compressor under the following conditions with the specified characteristics:

1. Inlet air conditions
  - a. Temperature range, degrees F 50 to 100
  - b. Relative humidity, percent 1 to 100
  - c. Pressure, psia 14.7
2. Stages Two
3. Mounting Horizontal
4. Rated discharge pressure, psig 175
5. Relief valve setting psig 200
6. Minimum capacity at rated discharge pressure, scfm 72.0
7. Maximum motor speed, rpm 1800
8. Maximum compressor speed, rpm 670
9. Motor horsepower, minimum 20
10. Motor enclosure TEFC
11. Power Supply 460V/3 pH/60 Hz

- B. Receiver

1. Minimum capacity, gallons 120
2. Diameter, feet 2
3. Position Horizontal
4. Working pressure, psig 190

- C. Refrigerated Air Dryer: Rate air dryer in accordance with the standard rating conditions of the National Fluid Power Association for Class H Dryers, i.e. 33 to 39 degrees F pressure dew point range at 100 psig and 100 degrees F inlet air, and 100 degrees F ambient air with a maximum pressure drop of 5 psi. Under this rating, provide the dryer with a capacity not less than 75 scfm.

## 1.05 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Contractor's Drawings: Submit working drawings, including arrangement and erection drawings of the compressed air equipment and control equipment; installation templates; schematic control diagrams, electrical connection diagrams, and complete description of the control system. Information submitted shall be in accordance with Section 01330 - Shop drawings.

- C. Quality Control Submittals: Submit the following:
  - 1. Manufacturer's certified performance and material records as specified.
  - 2. Manufacturer's certified copies of Field Test Reports.
- D. Operation and Maintenance Manuals: Submit Operation and Maintenance (O&M) instructions for the compressed air equipment. Operation and Maintenance (O&M) instructions shall be in accordance with Section 01831 - Operation and Maintenance Manuals.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle compressed air equipment as specified in Division 1 and as follows:
  - 1. Protect all electrical equipment from the weather during transit and storage by suitable means, including shrink wrapping or hand wrapping and taping.

#### 1.07 SPARE PARTS

- A. The equipment manufacturer shall submit for approval a spare parts list in accordance with the requirements set forth in Section 01750 - Spare Parts and Maintenance Materials.
- B. The following minimum spare parts for the compressed air equipment shall be provided and be packaged separately for each of the two Stations:
  - 1. One set of V-belts for the compressor
  - 2. One set of replacement filters for the compressor
  - 3. One set of intake and discharge valves for the compressor
  - 4. One air hose valve assembly
  - 5. One filter regulator and lubricator

### PART 2 PRODUCTS

#### 2.01 MANUFACTURER

- A. The equipment covered by these Specifications shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed in accordance with the best practices of the trade and as shown on the Contract Drawings.
- B. The compressor, dryer and ancillary equipment shall be provided by the Contractor through a single vendor. The Contractor, through the vendor, shall have the responsibility of matching all components and providing equipment which function together as a system.

C. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Compressor Units

- a. Ingersoll-Rand Company, Model No. 2000E20 FP
- b. Gardner Denver Company
- c. Quincy Compressor
- d. Or approved equal

2. Refrigerated Air Dryer

- a. Ingersoll-Rand Company, Model No. DS75
- b. Hankinson
- c. Arrow
- d. Or approved equal

3. Flexible Connectors for Compressor

- a. Anaconda
- b. Metraflex
- c. Gardner Denver Company
- d. Quincy Compressor
- e. Or approved equal

4. Filter/Regulator/Lubricator – Combination Unit

- a. Ingersoll-Rand Company, Model No. 38328951
- b. Gardner Denver Company
- c. Quincy Compressor
- d. Chicago Pneumatic
- e. Parker-Hannifin Corporation
- f. Or approved equal

5. Hose Reel Assembly

- a. Reelcraft, Columbia City, IN, Model No. 7800-OLS
- b. Hannay Reels
- c. Or approved equal

6. Automatic Drain Valve

- a. Ingersoll-Rand Company, Model No. EDV 2000
- b. ASCO Valves
- c. Magnatrol Valve
- d. Or approved equal

## 2.02 AIR COMPRESSOR UNIT

- A. General: Assemble air compressor unit to include a compressor, electric motor with starter, V-belt drive with belt take-up and suitable belt guard, air receiver tank, inlet air filter and silencer, adjustable pressure switch for stop-start control, safety relief valve, check valve, pressure gauge, vibration isolators, flexible pipe connection, and aftercooler.
- B. Design: Provide air compressor of the oil-lubricated, reciprocating, air cooled, horizontal, two-stage, tank mounted type, equipped with an automatic pressure regulator, automatic pressure unloader providing no load starting, and oil level or oil pressure protection. Provide two stages with an intercooler and interstage safety valve.
- C. Tank Mounted: Mount compressor with its motor on a common structural steel base plate which is mounted on a minimum 120-gallon air receiver tank.
- D. Relief Valve: Install an ASME safety relief valve as an integral part of the compressor or between the compressor and discharge check valve.
- E. Inlet Filter and Silencer: Provide compressor inlet with an air filter and silencer of the dry filter, radially pleated type enclosed in a steel housing, adequately sized for the capacity of the compressor.
- F. Vibration Isolators: Set air compressor on a minimum of four vibration isolators attached to the base plate. Provide each isolator with steel springs, steel top and bottom plates, leveling bolts and resilient chocks. Design the isolators to control oscillation and to withstand all lateral forces.
- G. Pipe and Connections: Provide pipe connection from the air compressor to three air tool stations, and fluid dispensing pumps (See Section 15195 – Fluid Dispensing System), and as indicated on the Contract Drawings. Each air tool station shall include a combination filter/regulator/lubricator unit and hose reel with hose and outlet. Compressed air piping shall be stainless steel meeting the requirements of Section 15052 - Steel and Stainless Steel Pipe, Section 15076G - Piping and Equipment Identification, and Section 15060 - Hangers and Supports.
- H. Low Oil Level Switch: Switch shall be provided to prevent the compressor from operating when oil level is low.
- I. High Dust Air Filter: A heavy duty, 10-micron, high dust inlet filter with built-in centrifugal pre-cleaner and automatic dust ejector valve shall be provided.
- J. E-Series Starter (Mounted and Wired): E-Series starter (mounted and wired) shall be provided for full voltage control of the electric motor. Thermal relays shall be provided to protect the motor windings from currents and resultant temperature rise

caused by overloaded motor, low line voltage or stalled rotor. Reset button mounted and wired to the NEMA 4X Stainless Steel enclosure shall be included.

- K. Automatic Drain Valve: Provide automatic drain valve that effectively removes condensate from the air compressor. The drain valve shall be 120-volt electric condensate drain valves (receiver mounted/with 6-foot power cord). The drain valve shall be incorporated with a solenoid valve and an electric timer, and be 1" NPT. The timer shall contain the following settings: 0.5 - 10 second purge duration, and 0 - 45 minute drain cycle, and "Push To Test" button. The drain valve shall include a manual by pass and a strain/ball valve assembly. The drain valve shall be made of Type 304 stainless steel. Pipe and pipe connections shall be provided under this contract as indicated on the Contract Drawings. Valves shall be in accordance with Section 15112 - Valves Smaller Than Four (4) Inches.

## 2.03 AFTERCOOLER

- A. General: Equip the air compressor unit with an OSHA Compliant beltguard, aftercooler integrally mounted with the compressor and belt drive.
- B. Beltguard Type: Provide beltguard aftercooler with a capacity and pressure rating adequate for the compressor. Design aftercooler for an approach temperature not to exceed 25 degrees F (temperature difference between air leaving the aftercooler and ambient air). Provide a mechanical moisture separator and automatic float type condensate drain on the aftercooler discharge. Size the separator inlet and the aftercooler outlet to be identical.

## 2.04 RECEIVER

- A. General: Construct air receiver tank of welded steel meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, for unfired pressure vessels and bearing an ASME stamp. Provide the tank with dished ends and with feet or a base for mounting in a horizontal position.
- B. Appurtenances: Equip air receiver with a pressure gauge, plugged inspection openings, an automatic drain valve, an ASME pressure relief valve, and all necessary pipe connections.
  - 1. Fit air receiver with an automatic moisture eliminator to remove condensate at each starting of the compressor.

## 2.05 REFRIGERATED AIR DRYER

- A. General: Equip refrigerated air dryer with a condensing unit, refrigerant evaporator, mechanical separator automatic condensate discharge valve, high discharge air temperature alarm light and switch for actuating a remote alarm, prefilter and afterfilter.

- B. Filter: Equip dryer with filters to remove oil carryover, oil aerosols and other foreign matter. Install a prefilter near the dryer inlet and install an afterfilter near the dryer discharge. Design the prefilter for mechanical removal of solid and liquid particles, and equip prefilter with a porous bronze filter element with a 5 micron rating. Provide an afterfilter of the coalescing type with a 0.5 micron rating.
- C. Power: Design dryer for a 115-volt, single-phase, 60-hertz power supply. Provide air dryer as a wall-mounted unit.
- D. Automatic Drain Valve: Provide automatic drain valve that effectively removes condensate from the air compressor. The drain valve shall be 120-volt electric condensate drain valves (receiver mounted/with 6-foot power cord). The drain valve shall be incorporated with a solenoid valve and an electric timer, and be 3/8" NPT. The timer shall contain the following settings: 0.5 - 10 second purge duration, and 0 - 45 minute drain cycle, and "Push To Test" button. The drain valve shall include a manual by pass and a strain/ball valve assembly. The drain valve shall be made of 304 stainless steel. Pipe and pipe connections shall be provided under this contract as indicated on the Contract Drawings and in accordance with Section 15052 - Steel and Stainless Steel Pipe.

## 2.06 PRESSURE RELIEF VALVE

- A. General: Provide threaded pressure relief valve of the spring-loaded, bronze, pop-safety type designed for compressed air service. Design the valve to "pop" open at the specified set pressure of 200 psig and be capable of relieving the specified air flow capacity of the compressor at 220 psig. Mount the pressure relief valve on the air receiver. Furnish valve meeting the requirements of the ASME Code for unfired pressure vessels and bearing the Code stamp.

## 2.07 GAUGES

- A. Provide pressure gauges of the Bourdon tube type with minimum 6-inch diameter dials, plainly marked. Connect each gauge with red brass pipe, fittings and isolating stopcocks. Equip each gauge with a snubber and threaded protective diaphragm seal. Furnish gauges with a range of 0 to 300 psig.

## 2.08 BEARINGS

- A. General: Manufacture the compressor with bearings of the antifriction ball or roller type of ample size to carry the loads imposed under continuous service without overheating.
- B. Radial and Thrust: Equip compressor with radial and thrust bearings. One of the bearings in each case may be combined with the thrust bearing.



- C. Life: Design all bearings to be accessible and located for convenient repair or replacement with an average B-10 operating life of not less than 100,000 hours according to AFBMA 9 and AFBMA 11.

## 2.09 LUBRICATION

- A. General: Provide oil lubricated compressor bearings.
- B. Reservoir: Use a reservoir system or other approved method. Provide all bearings with oil reservoirs to insure a constant supply of clean oil and with suitable gauges to give visual indication that an adequate supply of lubricant is available and is being supplied to the bearings.
- C. Drip and Drain: Make provisions to prevent throwing or dripping of lubricant from the bearings and properly drain all oil sumps and pockets.
- D. Oil Supply: Supply such oil of the kind and quality specified by the compressor manufacturer as is necessary to place the compressor unit in regular operation for a period of one year.

## 2.10 PRESSURE REDUCING STATIONS

- A. General: Provide each tool station with a pressure reducing station consisting of a line filter, pressure regulating valve, bypass, pressure gauge and pressure relief valve. Arrange the pressure reducing station to reduce the supply air pressure to a minimum downstream pressure of zero (0) PSI.
- B. Pressure Regulating Valves: Provide direct acting, spring loaded, diaphragm operated, single seated pressure regulating valves designed for compressed air service. Design the valves to maintain the selected downstream pressures with inlet pressures up to 175 psig. Provide downstream pressure settings to be field adjustable.
- C. Other Requirements: Provide pressure gauges as specified in Subsection 2.07. Provide pressure relief valves as specified in Subsection 2.06. Equip line filters with a porous bronze filter element with a 5-micron rating and a manual drain valve.

## 2.11 AIR TOOL STATIONS

- A. General: Construct each air tool station to include a filter and moisture separator, pressure regulator, lubricator, and an air hose assembly. Equip the filter and moisture separator with a manual drain valve designed for a maximum pressure of 300 psi. Equip the pressure regulator with a pressure gauge and provide a pressure regulator of the self-relieving type designed for a maximum pressure of 400 psi. Design the lubricator for a maximum pressure of 300 psi.

- B. Air Hose Valve Assembly: Provide air hose valve assemblies consisting of a 1/2-inch globe valve designed to operate satisfactorily at a pressure of 175 psig, adapted to a 1/2-inch safety quick-detachable steel hose coupling to prevent airflow until the coupling is fully engaged and locked, and a steel threaded 1/2-inch quick-detachable male hose coupling attached to the safety coupling.
1. Furnish three 50-foot lengths of 1/2-inch air hose with quick pressure couplings at each end. In addition, furnish three air guns with nozzles and self-closing valves.
  2. Furnish three stainless steel hose reels capable of holding 50-foot length of 1/2-inch air hose.

## 2.12 ACCESSORIES

- A. Control Panel: Provide a local control panel from the compressor manufacturer located near the compressor. Manufacture the control panel to include, but not be limited to, the following equipment:
1. ON-OFF/LOCKOUT switch for the compressor
  2. Low oil level or pressure indicating light for the compressor
  3. Low system pressure indicating light
  4. Discharge pressure gauge
  5. Aftercooler discharge temperature gauge
- B. Safety Requirements for Control Panel: Provide all accessories and appurtenances required for the safe, proper operation of the air compressor equipment as described herein whether or not such components have been specifically shown or specified. Provide compressor controls, control panel and wiring meeting applicable requirements of Section 16445 - Motor Control Centers and Section 16055 - Electrical Requirements for Shop-Assembled Equipment, of the Electrical Contract.
- C. Motor: Design air compressor drive motor for operation at 460 volts, 3 phase, 60 hertz. Motors shall be in accordance with Section 16220 - Electric Motors of the Electrical Contract.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install compressed air equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Section 01732 - Installation of Equipment.

### 3.02 FIELD TESTS

- A. Provide Field-Testing in accordance with Section 01811 - Preliminary and Final Field Tests.
- B. Testing: After the installation of the air compressor and all appurtenances, subject the compressor to a field running test under actual operating conditions. Perform field test as directed and in the presence of the Commissioner. Compressed air equipment shall be in accordance with Section 01431 - Quality Assurance Inspection. Perform the field test to demonstrate that under all conditions of operation the unit:
  - 1. Has not been damaged by transportation or installation
  - 2. Has been properly installed
  - 3. Has no mechanical defects
  - 4. Has been properly connected
  - 5. Is in proper alignment
  - 6. Is free of overheating of any parts
  - 7. Is free of all objectionable vibration
  - 8. Is free of excessive noise
  - 9. Is free of overloading of any parts
  - 10. Operates as specified with the control system
- C. Defects: Promptly correct any defects in the equipment or failure to meet the requirements of the Specifications.

### 3.03 MANUFACTURERS' FIELD SERVICES

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the compressed air equipment manufacturer to inspect the installation of the compressed air equipment, place it in operation, make any necessary adjustments, and instruct the operating personnel in its operation and maintenance.
- B. Six hours of training shall be provided in accordance with Section 01821 - Training.

### 3.04 CLEANING AND PAINTING

- A. Paint the compressed air equipment as specified in Section 09912 - Interior Painting.

-END OF SECTION-

**Section 11451**  
**DOMESTIC TYPE EQUIPMENT**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Microwave ovens
  - 2. Refrigerator/freezers
- B. Related Sections include the following:
  - 1. Division 06 Section "Architectural Woodwork / Casework"

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.
- B. Warranties: Special warranties specified in this Section.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 30 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- B. Source Limitations: Obtain residential appliances through one source from a single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

- D. Regulatory Requirements: Comply with provisions of the following product certifications:
  - 1. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
  - 2. NAECA: Provide residential appliances that comply with NAECA standards.
- E. AHAM Standards: Provide appliances that comply with the following AHAM standards:
  - 1. Household Refrigerators: AHAM HRF-1
- F. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.
  - 1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

#### 1.05 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Microwave Oven: Five-year limited warranty for defects in the magnetron tube.
  - 2. Refrigerator/Freezer: Five-year limited warranty for the sealed refrigeration system.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Basis-of-Design Product: The design for each appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

**B. Microwave Oven**

1. Basis-of-Design Product: Frigidaire PLMB209D C – 2.0 Cu. Ft. Countertop Microwave Oven or a comparable product by one of the following:
  - a. Amana Appliances
  - b. Maytag
  - c. General Electric
2. Oven: Standard features include the following:
  - a. Oven Capacity: 2.0 cu. ft.
  - b. Oven Features: Digital control panel with timer display, turntable and stainless steel finish.
  - c. Mounting: Countertop.
  - d. Electrical Power: 1200 W.
  - e. Oven Door: stainless steel finish with observation window.

**2.02 REFRIGERATION APPLIANCES****A. Refrigerator:**

1. Basis-of-Design: Product: PLRU1778ES0 -16.7 cu.ft. Stainless Steel All Refrigerator or a comparable product by one of the following:
  - a. Amana Appliances
  - b. Maytag
  - c. General Electric
2. Type: Freestanding, one-door, frost-free, refrigerator only.
3. Storage Capacity
  - a. 16.7 cu ft
4. Refrigerator Features
  - a. 1 Fixed Glass Shelf
  - b. 3 Cantilever Glass Shelves
  - c. 1 Fixed White Gallon Door Bin
  - d. 2 Clear Crispers
  - e. 4 Clear Adjustable Door Bins
  - f. Clear Dairy Door
  - g. Clear Dairy Drawer

- h. Interior light.
- i. Stainless steel finish

5. Front Panel: Stainless-steel door front and lower access panel.

6. Appliance Color: Stainless steel

## 2.03 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Stainless-Steel Finish: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including ground and polished stainless-steel surfaces for uniform, directionally textured finish.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

### 3.03 CLEANING AND PROTECTION

- A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain appliances.

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 11501  
SAFETY EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall furnish, install and store the safety equipment required and in the quantities specified in accordance with the requirements specified herein.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 01732 - Installation of Equipment
- C. Section 01831 - Operation and Maintenance Manuals
- D. Section 15076 - Piping and Equipment Identification

**1.03 REFERENCES**

- A. ANSI Z87.1 - Practice for Occupational and Educational Eye and Face Protection
- B. ANSI S12.6 - Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
- C. ANSI-ISEA 107 - High-Visibility Safety Apparel

**1.04 SUBMITTALS**

- A. Provide all submittals, including the following, as specified in Division 1.
- B. The Contractor shall submit shop drawings, catalog cuts, and data sheets for approval by the Commissioner in accordance with Section 01330 - Shop Drawings.
- C. The Contractor shall submit operation and maintenance manuals for approval by the Commissioner in accordance with Section 01831 - Operation and Maintenance Manuals.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Materials and Equipment: Equipment shall not be delivered to the project site until the time set forth in the approved construction schedule for delivery and installation. Equipment furnish with no requirement for permanent installation shall be delivered near the end of the construction period

**B. Storage of Materials and Equipment**

1. Materials and equipment shall be delivered in original, undamaged packaging with manufacturer's labels and seals intact.
2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.
3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into the work.

**PART 2 PRODUCTS****2.01 FIRST AID KITS**

- A. First aid kit shall be of the industrial type and shall consist of a balanced assortment of first aid supplies adequate to administer first aid for a minimum of twenty-five (25) people. Each kit shall contain adhesive bandages, gauze pads and tape, elastic bandages, first aid cream, burn cream, cold pack, eye solution, pain reliever, scissors, tweezers, disposable gloves and First Aid Guide. Quantity of kits shall be as listed in the Summary Schedule.
- B. First aid supplies shall be furnished in a sturdy, weatherproof, dustproof and rust resistant case with a carrying handle and wall brackets.
- C. Products
  1. North, Model 019703
  2. Northern Safety Co. Inc., Item # 253-6443
  3. or approved equal
- D. Location: First aid kits shall be wall mounted where shown on the Contract Drawings.

**2.02 STRETCHER AND CASE**

- A. Stretcher shall have a minimum capacity of 350 pounds and be of the folding pole type, with aluminum poles and vinyl-coated nylon fabric.
- B. Stretcher shall be provided in a steel, wall-mountable storage case.

## C. Products

## 1. Stretcher

- a. Junkin, Model # JSA-655-NA
- b. FERNO, Lab Safety Supply Item # 4CF-11366
- c. Or approved equal

## 2. Stretcher Case

- a. Junkin, Model #JSA-600
- b. FERNO, Lab Safety Supply
- c. Or approved equal

- D. Location: The stretcher shall be enclosed in a stretcher case and shall be wall mounted near the west access to the pier, as shown on the Contract Drawings.

## 2.03 EMERGENCY BLANKETS

- A. Emergency blanket shall have a surface of a minimum of 70 percent wool. Blanket shall be furnished in a wall-mountable case. Quantity of blankets shall be as listed in the Summary Schedule.

- B. Size: Approximate size of blanket shall be 62 inches by 82 inches.

## C. Products

1. Lab Safety Supply, Item # 16901
2. Steiner, Model BTPCO
3. Or approved equal

- D. Location: Emergency blankets shall be wall mounted near the access to the pier, as shown on the Contract Drawings.

## 2.04 RESPIRATORS

- A. Full-face respirator shall consist of a soft silicone face piece with a wraparound polycarbonate lens with a 200-degree field of vision. Impact resistant lens shall meet requirements of ANSI Z87.1. Respirator shall be provided with a multi-strap head harness, nose cup and speaking diaphragm. Package of filter/cartridge suitable for organic vapors and package for dusts, fumes and mists shall be provided with the respirator. Spare cartridges, filters, accessories, and cleaning supplies shall be provided.

- B. Size and quantity of respirators shall be as listed in the Summary Schedule.

## C. Products

1. North, Model 7600-8A (medium/large) / 7600-8AS (small)
2. 3M, Model 7800S
3. Or approved equal

- D. Location: Respirators shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

## 2.05 DISPOSABLE PARTICULATE RESPIRATORS

- A. Disposable particulate respirator shall consist of a lightweight moisture resistant filter media with an adjustable nosepiece and cushioned seal conforming to facial contours. Quantity of respirators shall be as listed in the Summary Schedule.

## B. Products

1. WILSON SAF-T-FIT, Model No. N9510M
2. North Particulate, Model No. 7130N95
3. Or approved equal

- C. Location: Disposable particulate respirators shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

## 2.06 RING PRESERVERS

- A. Ring preserver shall be 30 inches in diameter with a polyethylene shell (polyurethane float) resistant to chemicals and ultra-violet deterioration. Ring preserver shall be provided with braided polypropylene grab line and 30 feet of heaving line. Quantity of preservers shall be as listed in the Summary Schedule.

- B. A rack shall be provided for hanging each ring preserver, and brackets shall be provided to hold the heaving line.

## C. Products

1. West Marine- Model # 257873
2. Taylor, Model 571
3. Or approved equal

- D. Location: Ring preservers shall be evenly dispersed around the outside of the transfer station at the pier level, as shown on the Contract Drawings.

**2.07 RING PRESERVER RACKS**

- A. Roughneck ring preserver rack shall be heavy-duty, welded stainless steel rack that cradles the ring preserver at three points. Holes shall be pre-drilled for bulkhead mounting. U-bolts shall be provided for rail mounting. One rack shall be provided for each ring preserver.
- B. Ring Preserver Racks shall be 30 inches.
- C. Products
  - 1. West Marine, Model # 491632
  - 2. Jim-Buoy, Model # Jim-Lrr-1123-30
  - 3. Or approved equal

**2.08 OVER BOOTS**

- A. Over boots shall be one piece, molded polyvinyl and shall be waterproof and suitable for contamination protection. Boots shall fit over work shoes, be 10 inches high, and have a stepped snap closure to adjust fit and anti-skid tread for traction. Size and quantity of over boots shall be as listed in the Summary Schedule.
- B. Products
  - 1. Tingley, Lab Safety Supply No. 4CF-13135
  - 2. Talon Trax, Model No. 3XE87
  - 3. Or approved equal
- C. Location: Over boots shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

**2.09 HEARING PROTECTION EARMUFFS**

- A. Earmuffs for hearing protection shall comply with the requirements of ANSI S12.6 for high noise environments; padded stainless steel headband shall allow for convenient, comfortable alignment on head, with earmuffs providing an NRR:29dB. Earmuffs shall be provided with a hygiene kit for cleaning after use. Quantity of earmuffs shall be as listed in the Summary Schedule.
- B. Products
  - 1. Howard Leight- Thunder 29, Model QM29
  - 2. Bilsom- Viking 29, Model 2318-02
  - 3. Or approved equal
- C. Location: Hearing protection earmuffs shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

**2.10 NITRILE GLOVES**

- A. Nitrile gloves shall be flock-lined with pebble pattern on palms and fingers. Gloves shall be approximately 13 inches in length and have a flared gauntlet to fit over sleeves. Quantity and size of gloves shall be as listed in the Summary Schedule.
- B. Products
  - 1. Ansell, Model 117275
  - 2. Best, Model 730
  - 3. Or approved equal
- C. Location: Nitrile gloves shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

**2.11 PERSONAL FLOTATION DEVICES**

- A. Personal flotation devices shall be a Type III PFD approved by the United States Coast Guard. The PFD shall be a vest in a comfortable style that is designed for continuous wear. The vest shall be flexible and waterproof and shall include, S.O.L.A.S. approved reflective tape for visibility, side adjustment straps, and D-rings for lanyard attachment. Size and quantity of PFDs shall be as listed in the Summary Schedule.
- B. Products
  - 1. Mustang, Model MV3128T2
  - 2. West Marine, Model 196750
  - 3. Or approved equal
- C. Location: PFDs shall be located in two (2) personal flotation device storage cabinets as described below.

**2.12 PERSONAL FLOTATION DEVICE STORAGE CABINETS**

- A. Cabinets shall be manufactured with high quality materials and designed to shield personal flotation devices from UV rays, chemicals, moisture, dust, salt air, insects, and temperature extremes.
- B. Cabinets shall be wall or floor mounted.
- C. Products
  - 1. Thomas Products, Model: LJC-72
  - 2. JoBird
  - 3. Or approved equal

- D. Location: A total of two (2) cabinets shall be provided. Each cabinet shall hold 12 personal flotation devices. One cabinet shall be located near the west access to the pier and the other cabinet shall be located near the east access to the pier, as shown on the Contract Drawings.

#### 2.13 REFLECTIVE VESTS

- A. Reflective vest shall meet ANSI-ISEA 107 Class 1 standard for safety garments. The vest shall have a front zipper and a minimum of two pockets. Quantity of vests shall be as listed in the Summary Schedule.
- B. Size: Reflective vests shall be standard size.
- C. Products
  - 1. Services and Materials Company, Model 2080626
  - 2. Glo-Lite, Model HVWB3/2BZ
  - 3. Or approved equal
- D. Location: Reflective vests shall be located in the Safety Equipment Cabinets as described herein. See Contract Drawings for location of cabinets.

#### 2.14 CONVEX MIRRORS

- A. Convex mirror shall provide 160° of viewing and shall be made of a break-resistant material.
- B. Size: The mirror shall be 26 inches in diameter and shall be suitable for both indoor and outdoor use.
- C. Products
  - 1. L.K. Goodwin Co., Model PLXR-26
  - 2. Lab Safety Supply, Item # 4CF-14118
  - 3. Or approved equal
- D. Location: Convex mirrors shall be located at the where shown on the Contract Drawings. Convex mirrors shall be installed at a standard height.

#### 2.15 SAFETY EQUIPMENT CABINETS

- A. Safety equipment cabinets shall be heavy duty, heavy load storage cabinets. Cabinets are furnished with stainless steel doors. Doors shall operate on three semi-concealed stainless steel hinges. Cabinets shall be 'key' locked.
- B. Size: Cabinets shall be 60 inches high by 47 inches wide by 18 inches deep, shall be weathered iron in color, and have 3 stainless steel shelves.



## C. Products

1. Medical Resource USA, Model No. ES47.
2. Lab-Gear
3. Or approved equal

## D. Location: See Contract Drawings for location of each cabinet.

## E. Cabinets A and B shall each contain:

1. 8 Respirators
2. 4 Boxes of disposable particulate respirators
3. 4 Pairs of over boots
4. 8 Pairs of hearing protection earmuffs
5. 24 Pairs of nitrile gloves
6. 8 Reflective vests

## F. Cabinets C and D shall each contain:

1. 10 Pairs of over boots
2. 4 Pairs of hearing protection earmuffs
3. 24 Pairs of nitrile gloves
4. 8 Reflective vests

## 2.16 SUMMARY SCHEDULE

- A. This schedule summarizes the quantities of each type of safety equipment described in the preceding subsections and is presented here for convenience. Provide the specified safety equipment in the following quantities.

1. First Aid Kits	-	10
2. Stretcher	-	1
3. Stretcher Case	-	1
4. Emergency Blankets	-	2
5. Respirators	-	16(12 med/large, 4 small)
6. Disposable Particulate Respirators	-	8 boxes of 20
7. Ring Preservers	-	12
8. Ring Preserver Racks	-	12
9. Overboots	-	28 pairs
		(2 small, 4 medium, 6 large, 8 XL, 8 XXL)
10. Hearing Protection Earmuffs	-	24 pairs
11. Nitrile Gloves	-	96 pairs
		(12 medium, 36 large, 36 XL, 12 XXL)
12. Personal Flotation Devices	-	24
		(2 small, 4 medium, 8 large, 10 XL)
13. Personal Flotation Device Storage Cabinets	-	2
14. Reflective Vests	-	32

- |                               |   |   |
|-------------------------------|---|---|
| 15. Convex Mirrors            | - | 2 |
| 16. Safety Equipment Cabinets | - | 4 |

2.17 EQUIPMENT IDENTIFICATION

- A. Furnish and install equipment nameplates for the equipment in conformance with Section 15076 – Piping and Equipment Identification.

PART 3 EXECUTION

3.01 INSTALLATION AND STORAGE

- A. Equipment cabinets, racks and brackets to be furnished and installed shall be positioned plumb and true, securely anchored in place with proper clips, brackets and bolts for the type of installation required, and as specified in Section 01732 – Installation of Equipment.
- B. Equipment to be furnished and stored shall be stored in accordance with the manufacturer's directions.
- C. Installation and storage of equipment will be at locations shown on the Contract Drawing or as directed by the Commissioner.

3.02 PROTECTION

- A. Safety equipment shall be protected from all damage and abuse until Final Acceptance by the City of New York.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 11510**  
**MAINTENANCE BAY, SHOP AND STORAGE EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This specification describes the specific requirements for furnishing and installing maintenance bay, machine shop and storage equipment with all accessories necessary for a complete installation as well as metal storage shelving for storage rooms and machine shop room. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install the maintenance bay equipment.

**1.02 RELATED SECTIONS**

- |    |               |   |                                       |
|----|---------------|---|---------------------------------------|
| A. | Section 01330 | - | Shop Drawings                         |
| B. | Section 01431 | - | Quality Assurance Inspection          |
| C. | Section 01732 | - | Installation of Equipment             |
| D. | Section 01750 | - | Spare Parts and Maintenance Materials |
| E. | Section 01811 | - | Preliminary and Final Field Tests     |
| F. | Section 01821 | - | Training                              |
| G. | Section 01831 | - | Operation and Maintenance Manuals     |
| H. | Section 09912 | - | Interior Painting                     |

**1.03 SUBMITTALS**

- A. The Contractor shall submit the following in accordance with General Conditions; and as per Detailed Specification Section 01330 - Shop Drawings.
1. Working Drawings: Working drawings shall be submitted, including complete layout and configuration of the shop equipment and all other components and accessories. The drawings shall include all necessary restrictive and non-restrictive working usage notes and general safety notes.
  2. List of spare parts
  3. Operation and maintenance manuals: Submit Operation and Maintenance (O & M) instructions for the Maintenance Bay Shop and Storage Equipment in accordance with Section 01831 – Operation and Maintenance Manuals.

**1.04 QUALITY ASSURANCE**

- A. Quality assurance shall be in accordance with Section 01431 – Quality Assurance Inspection.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Materials and Equipment: Equipment shall not be delivered to the project site until the time set forth in the approved construction schedule for delivery and installation. Equipment furnished with no requirement for permanent installation shall be delivered near the end of the construction period.
- B. Storage of Materials and Equipment
  - 1. Materials and equipment shall be delivered in original, undamaged packaging with manufacturer's labels and seals intact.
  - 2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.
  - 3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into the Work.
- C. Handling of Materials and Equipment
  - 1. Materials and equipment shall be handled carefully in order to avoid damage or breakage.
  - 2. Materials and equipment shall not be exposed to detrimental conditions or physical damage. Materials and equipment that are so exposed shall be removed from the job-site and shall not be incorporated into the Work. If incorporated into the Work, they shall be removed and replaced, up to and including the time of final inspection, at no additional expense to the City of New York.
  - 3. Packages or containers shall not be opened until all necessary preparatory work is complete and installation is to begin immediately. Materials and equipment shall not be allowed to become wet or soiled or covered with ice or snow.

**1.06 SPARE PARTS, TOOLS AND SUPPLIES**

- A. The equipment manufacturer shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in the General Requirements Section 01750 – Spare Parts and Maintenance Materials.

## PART 2 PRODUCTS

## 2.01 EQUIPMENT

- A. The equipment covered by these specifications shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed in accordance with the best practices of the trade and as shown on the Contract Drawings.
- B. Subject to compliance with requirements, provide equipment of one of the following manufacturers or an approved equivalent in accordance with Section 01631 – Equivalent Materials and Equipment.
- C. Provide the following equipment for the **MAINTENANCE BAY**:

1. **Portable Grease System**

- a. Shall include heavy duty wheeled cart and reel with 55 gallon drum capacity and 1/4"x50' hose reel. The grease system shall include a 60:1 grease pump, drum cover, follower plate, control valve with rigid tube, grease connection hose and air filter/regulator with gauge, and Grease Gun.
- b. Manufacturer: LiquiDynamics, or equivalent
- c. Model: 13070-S3
- d. Approximate Size: 36"x36"x44.5"(WxLxH)
- e. Quantity: One (1)

2. **Steel Drum Dolly**

- a. Shall have 1000 lbs capacity and be able to maneuver a 55-gallon metal drum.
- b. Manufacturer: Global Industrial Equipment, or equivalent
- c. Model: 233880
- d. Size: 24" Diameter
- e. Weight: 22 lbs
- f. Quantity: Two (2)

3. **Rolling Oil Drain Pan**

- a. Shall have 30-gallon capacity with splash guard screen. Shall include 3/4 in. threaded pipe plug for drain or pump valve.
- b. Manufacturer: Bend-Pak Inc., or equivalent
- c. Model: 144720
- d. Size: 34"x23"x7"(WxLxH)

- e. Weight: 100 lbs
- f. Quantity: One (1)

**4. Oil Drain Pump, Low Profile**

- a. Shall include air-powered evacuation kit that is compatible with rolling oil drain pan.
- b. Manufacturer: Bend-Pak Inc., or equivalent
- c. Model: 145996
- d. Weight: 5 lbs
- e. Quantity: One (1)

**5. Drum Wrench**

- a. Shall be corrosion resistant, able to remove any plug, and include 1" wrench for tightening faucets or pumps.
- b. Manufacturer: Global Industrial equipment, or equivalent
- c. Model: 227201
- d. Quantity: One (1)

**6. Drum Opener, Standard**

- a. Shall incorporate sharp edge steel blade that is capable of opening any size and gauge steel drum.
- b. Manufacturer: Global Industrial Equipment, or equivalent
- c. Model: 226376
- d. Quantity: One (1)

**7. Spigot Pump, pneumatic**

- a. Shall be an air-operated positive displacement piston pump capable of transferring and dispensing low to medium viscosity fluids from a 55-gallon drum.
- b. Manufacturer: Lincoln, or equivalent
- c. Model: 4480
- d. Quantity: Three (3)

**8. Vacuum**

- a. Shall function as a wet and dry shop vacuum with a tank capacity of 22 gallons.
- b. Manufacturer: Dayton, or equivalent
- c. Model: 1UG91
- d. Size: 24-1/2" Diam x 32-1/2"
- e. Motor: 6.5Hp, 120V, 60Hz., 1 Phase
- f. Quantity: One (1)

**9. Heavy-Duty Storage Rack**

- a. Shall include, 14-gauge steel shelves with a capacity of 3000 lbs each. Unit shall have no side or back panels.
- b. Manufacturer: Global Industrial, or equivalent
- c. Model: 236608
- d. Size: 18"x60"x72" (WxLxH)
- e. Weight: 228 lbs
- f. Shelf Capacity: 3000 lbs.
- g. Quantity: Three (3)
- h. Color: Gray

**10. Drum Funnel, self closing**

- a. Shall thread into 2" bung opening, have a 10.75" funnel mouth, a pad lockable cover, and a 32" shaft.
- b. Manufacturer: Global Industrial Equipment, or equivalent
- c. Model: 440128
- d. Size: 32" shaft, 10.75" funnel mouth
- e. Weight: 13 lbs
- f. Quantity: Four (4)

**11. Portable Welding Machine**

- a. Provide Model No. XMT Series 350 VS portable welding machine.
- b. Manufacturer: Miller Welds
- c. Voltage: 460V, 13.6Kw, 60Hz, 3 Phase
- d. Wire Feeder: 22A
- e. MIG Gun: Bernard Q-400 MIG Gun
- f. Consumables: .035 and .045 in drive roll kit
- g. Provide: Regulator/flow gauge with gas hose
- h. Provide: Factory-installed running gear/cylinder rack
- i. Quantity: One (1)

**12. Portable Oil Filtration System**

- a. Provide Model No. 10M40SA-10, portable oil filtration system.
- b. Manufacturer: Parker Filtration
- c. Primary Filtration: 40-micron synthetic polyester inlet filter
- d. Final Filtration: 10-micron cellulose filter
- e. Flow Rate: 10 GPM
- f. Motor: ¾ HP, 115 V, 10 amp, Thermal Overload
- g. Fluid Viscosity: 500 SUS
- h. Mounting: Two wheeled cart
- i. Hoses: Two 1" dia. X 7-ft. hoses
- j. Wands: Two 3" Wands



- k. Controls: Cart mounted ON/OFF switch
- l. Quantity: One (1)

D. Provide the following equipment for **STORAGE ROOM 3**

1. **Heavy-Duty Storage Rack**

- a. Shall include, 14-gauge steel shelves with a capacity of 3000 lbs each. Unit shall have no side or back panels.
- b. Manufacturer: Global Industrial, or equivalent
- c. Model: 236608
- d. Size: 18"x60"x72" (WxLxH)
- e. Weight: 228 lbs
- f. Shelf Capacity: 3000 lbs.
- g. Quantity: Twenty (20)
- h. Color: Gray

E. Provide the following equipment for **MACHINE SHOP ROOM**

1. **Heavy-Duty Storage Rack**

- a. Shall include, 14-gauge steel shelves with a capacity of 3000 lbs each. Unit shall have no side or back panels.
- b. Manufacturer: Global Industrial, or equivalent
- c. Model: 236608
- d. Size: 18"x60"x72" (WxLxH)
- e. Weight: 228 lbs
- f. Shelf Capacity: 3000 lbs.
- g. Quantity: Twelve (12)
- h. Color: Gray

2. **Portable Welding Machine**

- a. Provide Model No. XMT Series, # 350 VS portable welding machine.
- b. Manufacturer: Miller Welds
- c. Wire Feeder: 22A
- d. MIG Gun: Bernard Q-400 MIG Gun
- e. Consumables: .035 and .045 in drive roll kit
- f. Provide: Regulator/flow gauge with gas hose
- g. Provide: Factory-installed running gear/cylinder rack
- h. Quantity: Two (2)

3. **Metal Cut-off Saw**

- a. Provide Model No. 3400, 6" x 10" Metal Cutting Band Saw
- b. Manufacturer: Wilton
- c. Model: 3410

- d. Size: 50"x18"x41" (WxLxH)
- e. Weight: 343 lbs
- f. Quantity: One (1)
- g. Motor: ¼ Hp, 115/230V, 60Hz, 1 phase
- h. Provide: Wet kit for use with Band Saws, Stock No. 4Z402

#### 4. Drill Press

- a. Provide Model No. 6W281, 20" Floor Drill Press
- b. Manufacturer: Dayton
- c. Model: 6W281
- d. Size: 19" x 34" x 68" (WxDxH)
- e. Weight: 425 lbs
- f. Quantity: One (1)
- g. Motor: 1 Hp, 120/230V, 60Hz.

#### 5. Parts Washer

- a. Provide Model No. 800A, 50 – 85 gallon parts washer
- b. Manufacturer: Graymills
- c. Model: 6H013
- d. Size: 41-3/8" x 29-3/8" x 34" (LxWxH)
- e. Weight: 300.0 lbs
- f. Quantity: One (1)

#### 6. Portable Air Compressor

- a. Provide Model No. 4B228, 20 gallon portable air compressor
- b. Manufacturer: Speedaire
- c. Model: 4B228
- d. Motor: 3.1Hp, 230V, 60Hz, 3Phase
- e. Size: 33" x 19 ½" x 31" (LxWxH)
- f. Weight: 151 lbs
- g. Max psi: 135 psi
- h. Tank Size: 20 gallons
- i. Quantity: Two (2)

#### 7. Work Bench Vises

- a. Provide Model No. F60/66997, bench vises
- b. Manufacturer: Rigid vises
- c. Model: 4WN29
- d. Weight: 63 lbs
- e. Max opening: 8.8 inches
- f. Quantity: Five (5)

**8. Ladders (6ft. & 10ft.)**

- a. Provide 6ft. and 10ft. ladders each as follows:

	6' ladder	10' ladder
Manufacturer	Werner	Werner
Model	7406	7410
Stock No	4XN72	4XN74
Weight (lbs)	26	44
Base width (in)	24 5/8	31 5/8
Spread (in)	42 7/8	79 7/8
Quantity	Two (2Ea.)	Two (2Ea.)

**9. 20 Ton Jacks & Stands**

- a. Provide 20 ton hydraulic jacks and stands
- b. Manufacturer: Marquette
- c. Model: W93233
- d. Height (closed): 10 3/4"
- e. Maximum Height: 18 1/2"
- f. Power Raise: 7 3/4 "
- g. Base Size: 5 1/2 " x 7"
- h. Weight: 43 lbs
- i. Quantity: Two (2 Ea.)

**10. Rotating Bin**

- a. Provide a rotating bin
- b. Manufacturer: Frick – Gallagher
- c. Model: 1308
- d. Number of Shelves: 8
- e. Load Capacity: 500 lbs
- f. Size: 21" x 15" x 7" (W x D x H)
- g. Quantity: One (1)

**11. Battery Charger**

- a. Provide wheel type 24V battery chargers
- b. Manufacturers: Dayton
- c. Model: 3LE82
- d. UL Rated Amps: 60 (6V), 60/40 (12V), 30 (24V)
- e. Voltage: 120V, 60Hz, 1Phase
- f. Start Amps: 225
- g. AC Amps Input: 12
- h. Size: 16" x 28 1/2 " x 15" (W x H x D)

- i. Weight: 76 lbs
- j. Quantity: Four (4)

**12. Fans**

- a. Provide a high-volume fan
- b. Manufacturer: Dayton
- c. Model: 3C995
- d. Blade Diameter: 36"
- e. Motor: ½ Hp, 120V, 60HZ, 1Phase
- f. CFM: 9280
- g. RPM: 825
- h. Size: 40 ½" x 39 ½" x 14" (H x W x D)
- i. Weight: 90 lbs
- j. Quantity: Two (2)

**13. Bench Grinder**

- a. OSHA compliant heavy duty bench grinder
- b. Manufacturer: Dayton
- c. Model: 4Z909
- d. Motor: ¾ HP
- e. Voltage: 115V, 60Hz, 1-Ph
- f. Amp Draw: 7.0
- g. Maximum RPM: 3450
- h. Quantity: One (1)
- i. Unit to include tool rests, spark arrestors, eye shields and 6ft. 3-conductor power cord
- j. Grinding Wheels: One (1) 36-grit and One (1) 60-grit
- k. Tool rests: Large cast-aluminum and tilts for angle grinding
- l. Wheel diameter: 8-inch
- m. Wheel face: 1-inch
- n. Dust collection: Vacuum attachment

**14. Tool Stand for Bench Grinder**

- a. Construction: Heavy cast iron with 3 ½ inch steel column
- b. Manufacturer: Dayton
- c. Model: 4Z154
- d. Overall Height: 31 ¾ inches
- e. Top of Stand: Cast slots and holes to mount grinder
- f. Base of Stand: Heavy cast iron 14 ½ x 16 ½ inches minimum
- g. Accessories: Cast iron water pot removable for cleaning
- h. Quantity: One (1)

**15. Arbor Press**

- a. Construction: Cast Iron
- b. Manufacturer: Dayton
- c. Model: 4Z328
- d. Quantity: One (1)
- e. Anvil: Slotted removable 4-position
- f. Ram: Steel with heavy large-toothed rack. Ram shall have a hole with hex head bolt for inserting special punches or tools.
- g. Base: Drilled for bolting to pedestal
- h. Force (Tons): 1 Ton
- i. Swing: 8 inches
- j. Table Dimensions: 5 x 4 ½ inches
- k. Anvil Diameter: 4 ½
- l. Ram Dimensions: 1 x 1

**16. Arbor Press Floor Stand**

- a. Construction: Welded Steel
- b. Manufacturer: Dayton
- c. Model: 1UH15 (ST100)
- d. Quantity: One (1)
- e. Size (In.): 18W x 24D x 33H
- f. Base (In.) 20L x 15W
- g. Top Size (In.) 16L x 9W

**17. Floor Sander**

- a. Construction: Heavy -gauge steel cabinet
- b. Manufacturer: Dayton
- c. Model: 4TJ97
- d. Quantity: One (1)
- e. Size: 12 inch Disc, 6 x 48 belt sander
- f. Voltage: 120 V, 60 Hz. 1 Ph.
- g. Motor: 1 ½ HP
- h. Table Tilt: 0 – 45 Degrees, with graduated scale angle of tilt
- i. Belt Adjustment: Fine thread adjustment with locking mechanism for accurate tracking
- j. Accessories: One (1) medium grit belt, One (1) medium grit disc, miter gauge and 3-conductor power cord
- k. Features: Belt oscillating feature, 3 inch idler drum and 4 inch dust collection port on both belt and disc housing

**18. Workbench**

- a. Shall include, extra heavy-duty workbenches with a capacity of 10,000 lbs each.
- b. Manufacturer: Global Industrial, or equivalent
- c. Model: 579315
- d. Size: 34"x72"x34" (WxLxH)
- e. Weight: 380 lbs
- f. Quantity: Five (5)
- g. Color: Gray

**F. Provide the following equipment for DRUM STORAGE ROOM:****1. Drum Rack**

- a. Shall be constructed of steel and store up to twelve 55-gallon drums, with a total capacity of not less than 15,000 lbs.
- b. Manufacturer: Modern Equipment, or equivalent
- c. Model: 793200
- d. Size: 36"x105"x84" (WxLxH)
- e. Weight: 515 lbs
- f. Quantity: Four (4)
- g. Color: Gray

**2. Drum Truck**

- a. Shall accept 55-gallon drums and include hook to securely engage rim of drum and kickstand for upright storage. Drum truck shall be constructed of heavy-duty steel with 1000 lbs. capacity and include a floating axle.
- b. Manufacturer: Global Industrial Equipment, or equivalent
- c. Model: 975273
- d. Approximate Size: 55-gallon drum
- e. Quantity: One (1)

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. The Contractor shall verify that areas to receive shop equipment are properly prepared and completed prior to the delivery and setup of the listed equipment.

**3.02 INSTALLATION**

- A. Shop equipment shall be installed in accordance with approved Working Drawings, Contract Specifications, and the manufacturer's instructions.

- B. All equipment shown on plans shall be installed true, level, tightly fitted, and flush to adjacent surfaces where required for installation. All anchorage and mounting devices required for the installation of each product shall be provided. Any contact between dissimilar metals shall be protected as specified in Section 09912 – Interior Painting.

### 3.03 FIELD TESTS

- A. Test the equipment to demonstrate the following:
  - 1. Equipment has not been damaged by transportation or installation.
  - 2. Equipment has been properly lubricated.
  - 3. Equipment is not overheating.
  - 4. Equipment is free of overloading of any part.
  - 5. Equipment has no electrical or mechanical defects.
  - 6. Compliance with the performance and design parameters.
  - 7. System operability under all control schemes.
- B. A qualified manufacturer's representative shall perform a full operating test in the presence of Commissioner. Contractor shall furnish all labor, materials and equipment required for such test and shall correct any deficiencies noted.
- C. Defects: Promptly correct any defects in the equipment or failure to meet the requirements of the specifications.

### 3.04 PROTECTION

- A. All components of the Work shall be protected from detrimental weather and damage until construction operations are completed and acceptable to Commissioner.
- B. Shop equipment shall be protected from all damage and abuse from all other contractors and installers involved in the Work until Final Acceptance by the City.

### 3.05 ADJUSTMENT

- A. The Contractor shall verify that all work performed under this section of the Specifications has been completed correctly and that all products function properly. Where necessary, items shall be adjusted to provide satisfactory operation.

### 3.06 PAINTING

- A. Paint color shall be as specified, and where not indicated, shall be the manufacturer's standard factory finish.

-END OF SECTION-

**Section 11570**  
**DUST SUPPRESSION SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES****A. High-pressure, fogging-type, dust suppression system comprising the following:**

1. Plunger pumps with motors
2. Variable frequency drives
3. Nozzles
4. Piping, tubing, fittings, valves and appurtenances
5. Stainless Steel bases
6. Inlet water filters
7. Control valves
8. Air Purge System
9. Heat Tracing and Insulation
10. System controls including all switches, gages and meters
11. All other accessories required to produce complete working system

**1.02 RELATED SPECIFICATIONS****A. Related Work specified in other sections includes, but is not limited to, the following:**

- |                   |   |   |
|-------------------|---|---|
| 1. Division 1     | - | General Requirements                          |
| 2. Section 02505  | - | Leakage Tests                                 |
| 3. Section 09912  | - | Interior Painting                             |
| 4. Section 15052  | - | Steel and Stainless Steel Pipe                |
| 5. Section 15060  | - | Hangers and Supports                          |
| 6. Section 15071  | - | Vibration Control                             |
| 7. Section 15076  | - | Piping and Equipment Identification           |
| 8. Section 15081  | - | Piping Insulation                             |
| 9. Section 15771  | - | Electric Heat Tracing Systems                 |
| 10. Division 16   | - | Electrical                                    |
| 11. Section 17212 | - | SCADA System - Programmable Logic Controllers |
| 12. Section 17320 | - | SCADA System - Control Panels and Enclosures  |
| 13. Section 17600 | - | SCADA System - Control Strategies             |

**1.03 SUBMITTALS**

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.**
- B. Shop Drawings:** Submit working drawings, including arrangement and erection drawings of the piping, equipment and control equipment; schematic control



diagrams; electrical connection diagrams; and complete description of the control system.

- C. Provide manufacturer's data showing pump performance, nozzle performance, motor horsepower, system pressures and other operational parameters.
- D. Operation and Maintenance: Submit operation and maintenance manuals for the dust suppression equipment.

#### 1.04 SYSTEM DESCRIPTION

- A. The dust suppression system manufacturer shall provide a package type system with all equipment and component parts completely mounted and assembled on the skid, piped and pre-wired requiring only external power for operation. The skid mounted system shall be used to control dust emission due to unloading, pushing and loading of municipal solid waste inside the transfer station. The piping and nozzle arrays in the transfer station will be located in an unheated area subject to freezing temperatures. Provide heat tracing and pipe insulation to protect the system from freezing as shown and specified in Specification Sections 15081 - Piping Insulation and 15771 - Electric Heat Tracing System. Provide purge air compressor system to purge complete system after an adjustable time delay after the drain valves are placed in the drain position. The dust suppression system is divided into nine zones, as shown on the Contract Drawings. Provide each zone with a control valve to safely put zones into or out of dust suppression service. Provide automatic draining of zones that are taken out of service to prevent dripping. Provide adjustable frequency drives to adjust pump discharge in response to manual selection of in-service zones and adjustable system pressure. Provide systems that can be totally drained and purged of water, including the pump heads and all piping.

#### 1.05 QUALITY ASSURANCE

- A. The dust suppression system manufacturer shall have a minimum of three (3) years experience.

#### 1.06 SPARE PARTS

- A. For each dust suppression system, provide the following spare parts:
  - 1. Fifty (50) nozzles
  - 2. Five Hundred (500) replacement polypropylene nozzle filters
  - 3. Thirty (30) replacement one (1) micron filter cartridges for low pressure twin filter
  - 4. Two (2) motorized 120 VAC, 1Ph. 3-way drain valves

5. Twelve (12) 21oz. bottles of pump oil

6. Two (2) Pump rebuild kits

#### 1.07 WARRANTY

- A. The Warranty shall be in conformance with Article 24 – Maintenance and Guaranty of the Standard Construction Contract.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Atomizing Systems, Inc.
2. Fogco Systems, Inc.
3. Johnson-March Systems, Inc.

#### 2.02 MATERIALS

- A. Provide nozzles capable of producing droplets mostly in the range of 5 to 20 microns at operating pressures of 500 to 1,200 psi. Each nozzle shall include a replaceable polypropylene filter element. Provide nozzles to produce enough fog to effectively control dust generated by the handling of municipal solid waste at the transfer stations, but as a minimum provide nozzles with a flow rate of 0.05 gpm at 1,200 psi system pressure. Provide nozzles of type 316 stainless steel construction, with NPT tapered thread connections.
- B. For nozzle manifolds, provide 1/2-inch O.D. type 316 stainless steel tubing with welded nozzle fittings rated for pressures up to 3,000 psi. Provide ASME certified welds. Provide nozzle fittings at not greater than 7'-6" spacing along manifold lines. Locate nozzles at required spacing adequate to produce and disperse enough fog to effectively control dust, but as a minimum locate nozzles at not greater than 15-feet spacing along manifold lines unless shown differently on the Contract Drawings. Plug any initially unused nozzle fittings to prevent leakage during operation. Provide valves that will allow the system to totally drain, without retaining water in the nozzle fittings.
- C. For system piping, provide 1/2-inch and 3/4-inch type 316 stainless steel tubing and compression fittings rated for pressures up to 3,000 psi.
- D. For zone control valves, provide 1/2-inch NPT, type 316 stainless steel, motorized ball valves rated at 3,000 psi, and suitable for 120 volt, 1Ph. operation. Provide 3-way ball valves to drain upon valve shutdown. Provide slow-acting ball valves with actuation time of five seconds minimum. Ball valves shall have totally enclosed

actuator gear train, factory lubricated. Motorized ball valves shall be Swagelok Whitey, or equal. Provide a manually-operated, ½-inch type 316 stainless steel two-way ball valve, rated at 3,000 psi, upstream of each motorized valve. The 3-way motorized zone control ball valves and 2-way manual ball valves shall be skid mounted, piped and pre-wired by the dust suppression equipment manufacturer.

- E. One air purge system (Compressor with Control Panel, Motor Starters and Controls) shall be provided to purge the remaining water in the Dust Suppression System after an adjustable time delay so that the drain valves have sufficient time to allow the long runs of tubing to drain. Once the purge air compressor is started, the system shall purge water by zones for an adjustable time period.
1. The purge air compressor shall include the following features:
    - a. Type: Two stage stationary vertical tank compressor
    - b. HP: 5
    - c. Max. Pressure: 175 PSI
    - d. Max. Air Capacity: 15 CFM minimum
    - e. Tank Capacity: 80 gallons
    - f. Power: 480v/60hz/3ph
    - g. Quantity: One (1)
  2. The air purge system local control panel shall include:
    - a. Enclosure: NEMA 4
    - b. Disconnect switch: Face panel mounted
    - c. PLC: 12 I/O
    - d. Relays: DPDT, 24v
    - e. Time Delay: Purge time period shall be adjustable from the panel front.
  3. The panel front shall contain the following items:
    - a. Low Temperature indicating light.
    - b. Running and Stopped indicating lights for the air compressor.
    - c. Open and Closed indicating lights for the three-way purge ball valve.
    - d. Open and Close push buttons for the three-way purge ball valve.
    - e. Auto Purge On-Off selector switch.
  4. All indicating lights shall be of the push-to-test LED indicating lamp type.
  5. When the Auto Purge selector switch is in the OFF Position, purging of the dust suppression system will be manually controlled by the operator, using the push buttons on the dust suppression system local control panel for control of the zone valves, and the push buttons on the purge control panel for the three-way purge ball valve.

6. When the Auto Purge selector switch is in the ON position, purging of the dust suppression system shall be automatic, triggered by a temperature sensor. Automatic Purging shall override other zone valve control commands, whether manual or remote. Purging shall start when the temperature decreases to a value approaching the freezing point, initially set at 35 degrees F. The sensor shall be mounted as shown.
  7. The temperature sensor shall be as follows:
    - a. Accuracy: Plus or minus 1 percent of span
    - b. Enclosure: NEMA 4X
    - c. Materials of Construction: Type 316 stainless steel
- F. Provide heavy-duty, direct drive, triplex plunger pumps with stainless steel wetted parts. Provide pumps to deliver enough water at sufficient pressure to the nozzles to effectively control dust generated by the handling of municipal solid waste at the transfer stations, but as a minimum provide pumps with a flow rate of 5.8 gpm at 1,200 psi system pressure. Size each pump to provide the entire system requirements. For each pump provide inlet solenoid valve to close on pump shut down, inlet water low-flow shut-off switch, stainless steel pulsation dampener, high temperature thermal water discharge valve, 2 1/2-inch diameter inlet and discharge oil-filled type pressure gauges, inlet and discharge isolation valves, discharge water pressure regulator, 4-20mA stainless steel pressure transducer rated at 2,000 psi minimum, pressure relief valve, dump solenoid valve to relieve system pressure on pump shut down, discharge check valve and discharge flex rubber hose pressure rated at 2,000 psi minimum. For each pump provide a drain valve with connection capable of fully draining the system, including the pump head. The pump motors shall be TEFC, minimum 5 HP and shall operate at 460-volt, 3-phase, 60-hertz.
1. Acceptable manufacturers for the plunger pumps are listed below.
    - a. General Pump
    - b. Cat Pumps Corporation
    - c. AR North America
    - d. Or approved equal
  2. Provide an inlet water low-pressure shut-off switch and a discharge high-pressure shut-off function controlled by the PLC controller for the plunger pumps.
- G. Provide industrial, multi-stage, polypropylene cartridge-type water filtration for the dust suppression systems to ensure 5-micron, minimum, filtration and appropriate flow to the pump units. Housings shall be stainless steel with replaceable cartridges. Provide inlet pressure regulator, inlet, outlet, air bleed and drain valves for the filtration unit. Components shall be mounted to skid and easily accessible. Provide a 2 1/2-inch diameter oil-filled type pressure gauge with isolation valves on the inlet and outlet to the filtration system.

- H. Mount the pumps, motors, control panel, filtration system, purge air system, motorized zone control valves, motor starters and associated components for each dust suppression system on a stainless steel skid equipped with vibration mounts and suitable for bolting to a concrete pad. Vibration control equipment shall meet the requirements of Section 15071 – Vibration Control. Situate skid components to allow easy access for maintenance. Provide stainless steel construction for the skid chassis including all brackets, supports, screws and other components. Size and install all structural components to comply with the requirements of the equipment being supported.
- I. Provide one constant torque, adjustable frequency drive (AFD) for each pump in the dust suppression systems to vary the speed of the corresponding plunger pump in response to system requirements. Normal operating pressure shall be as set at the pressure transducer when all zones are on-line. When zones are taken off-line, the AFD will decrease pump speed and output to maintain the normal operating pressure. Provide a set-point controller to adjust the system pressure. A minimum 4:1 turndown ratio shall be provided for the pump discharge flow. Provide AFD operation status indication including “Ready”, “Power On”, “Run” and “Fault” L.E.D. pilot lights.
- J. Adjustable Frequency Drive Requirements
  - 1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.
  - 2. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.
  - 3. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor’s full nameplate rating.
  - 4. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.
  - 5. Provide adjustable frequency drives that utilize 6-pulse drive technology.
  - 6. Operate at a minimum efficiency of 95 percent at rated load.
  - 7. Operate from a 460-volt, 3-phase, 60-hertz supply with a voltage variation of plus or minus 10-percent and a frequency variation of plus or minus 2-hertz.
  - 8. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.

9. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.
10. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.
11. Operate under the following ambient conditions:
  - a. Ambient Temperature: 0 to 40 degrees C
  - b. Humidity: 0 to 95 percent
12. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.
13. Manufacturers: Acceptable manufacturers are listed below.
  - a. Robicon
  - b. Cutler-Hammer
  - c. Toshiba
  - d. Or approved equal
14. Input Disconnect: Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.
15. Input Reactor: Provide input reactor or isolation transformer, if required.
16. Converter Section: Provide input section that converts 460-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes.
17. Filter Sections: Provide dc link reactor and filter capacitors as required.
18. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain a constant volts per hertz ratio on the output with voltage boost for startup as required.
19. Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:
  - a. Start push button
  - b. Stop push button
  - c. "Local-Remote" control selection
  - d. Speed control settings
  - e. Speed meter with hertz and 0-100 percent scales
  - f. Diagnostics package with fault indication and reset push button

- K. Provide local control panel at the pumps in a stainless steel, NEMA 4X enclosure with AFD and all control devices required to provide a complete functioning system. The control devices shall include but not be limited to the following:
1. Disconnect switch
  2. Hand-Off-Auto (H-O-A) selector switch for each pump
  3. Programmable logic controller, micro type, meeting the applicable requirements of Section 17212, Programmable Logic Controllers, Ethernet capable
  4. Pump 1-Pump 2 selector switch
  5. Off-Running indicating lights for each pump
  6. Local - Off- Remote selector switch for each zone valve
  7. On-Drain push buttons for each zone valve
  8. On-Drain indicating lights for each zone valve
  9. Pressure setpoint and drain time periods shall be adjustable from the panel front
- L. All indicator lights shall be of the push-to-test LED indicating lamp type.
- M. From the H-O-A selector switch, "Off" mode shuts pump off. In "Auto" mode, the AFD controls pump speed in response to pressure setpoint controller. In "Hand" mode, pump runs and allows operator to manually adjust speed. The Pump 1 - Pump 2 selector switch allows selection of the duty pump.
- N. Each zone control ball valve shall be controlled by a Local-Off-Remote selector switch located on the control panel. "Off" mode prohibits valve operation. In "Local" mode, each valve shall be operated by "On" and "Drain" push buttons mounted on the control panel. In "Remote" mode, each valve shall be operated by the SCADA system, as specified in Section 17600 – SCADA System – Control Strategies. Communication between the PLC and the SCADA system shall be via Ethernet. Coordinate with SCADA system supplier to provide complete operating controls with bumpless transfer.
- O. Ethernet communications to the SCADA system shall include, as a minimum, the following status information:
1. Pump Run (for each pump)
  2. Pump Fail (for each pump)
  3. Compressor Failure

4. System Fault (Comprised of the following)
    - a. Inlet Water Low Flow
    - b. Inlet Water Low Pressure
    - c. Discharge High Pressure
  5. Remote Mode (for each zone valve)
  6. Valve Open (for each zone valve)
  7. Valve Closed (for each zone valve)
  8. Low Temperature
  9. All of the above alarms including each condition that causes a system fault shall be separately displayed on the system control panel.
- P. Ethernet communication from the SCADA system shall include, as a minimum, the following commands:
1. Open valve (each zone valve)
  2. Close valve (each zone valve)
- Q. Provide all electrical and control components to meet the requirements of Division 16.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install dust suppression equipment in accordance with the manufacturer's recommendations and approved shop drawings, and as specified in Division 1.
- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on the proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1.
- C. Tests: After installation of the dust suppression equipment, controls and all appurtenances, subject the units to a field running test, as specified in Division 1, under actual operating conditions.
- D. Additional Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to inspect the completed installation, under actual operating conditions, after the system has been in operation for 60-days. Make any necessary adjustments.



3.02 CLEANING AND PAINTING

- A. Paint dust suppression equipment as specified in Section 09912 – Interior Painting. Do not paint stainless steel components.

3.03 TRAINING

- A. Provide training in accordance with Section 01821 – Start-up and Training.
- B. The manufacturer of the Dust Suppression System shall include one day of on-site classroom and hands-on training at the station. The day is on session of 8 hours.
  - 1. Maintenance – (2 hours) of training shall be included. Training to include operation of the system and regular maintenance (electrical, pneumatic and mechanical). Additionally the City of New York key maintenance personnel shall be allowed to “shadow” the installation process whenever possible. By “shadowing” the equipment installation, the highest level of practical knowledge can be obtained.
  - 2. Supervisors – (2 hours) of training shall be included. Training shall include operation of the system and basic trouble-shooting as a minimum.
  - 3. Operators Training – (4 hours) of on-site training shall be included. Operator training shall provide use skills along with safety training.

-END OF SECTION-

**Section 12484  
FLOOR MATS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Roll-up aluminum-tread rail floor mats with aluminum hinges
  - 2. Rubber and vinyl mats

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast in Place Concrete

**1.03 SUBMITTALS**

- A. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of floor mat and frame specified.
- B. Shop Drawings: For floor mats and frames. Show assembly, joint locations, installation details, layout, plans, elevations, sections, details of patterns or designs, accessories, anchors, and attachments to other Work.
- C. Samples for Initial Selection: For each type of floor mat and frame indicated.
- D. Samples for Verification: 12-inch- square assembled sections of floor mats, frame members, and tread rails with selected tread surface showing each type of metal finish and color of exposed floor mats, tread rails, frames, and accessories required.
- E. Maintenance Data: For cleaning and maintaining floor mats to include in maintenance manuals.

**1.04 QUALITY ASSURANCE**

- A. Accessibility Requirements: In addition to requirements of authorities having jurisdiction, provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

**1.05 PROJECT CONDITIONS**

- A. Field Measurements: Verify sizes by field measurements before fabrication and indicate measurements on Shop Drawings.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

#### A. Surface Roll-up Aluminum Rail Hinged Mats:

1. Construction Specialties, Inc.
2. J. L. Industries, Inc.
3. Musson, R. C. Rubber Co. (The).
4. Reese Enterprises, Inc.

#### B. Rubber and Vinyl Mats:

1. Musson, R. C. Rubber Co. (The).
2. Tennessee Mat Company, Inc.
3. Tepromark International, Inc.

### 2.02 METAL FRAME MATERIALS

- #### A. Extruded Aluminum: ASTM B 221, alloy 6061-T6 or alloy 6063-T5, T6, or T52 as standard with manufacturer.

### 2.03 FLOOR MATS

- #### A. General: Provide colors, patterns, and profiles of materials, including metals and metal finishes indicated or specified. If not indicated, provide colors, patterns, and profiles selected by the Commissioner from manufacturer's standards.
- #### B. Roll-up Aluminum Rail Hinged Mats: Clear-anodized finish, extruded-aluminum tread rails sitting on continuous vinyl cushions with 1-1/2-inch- wide by 3/8-inch-thick, tread rail modules. Provide aluminum hinges and plain serrated aluminum treads.
1. Locations: Entrances as indicated on drawings.
  2. Tapered Rigid Frame: Tapered extruded-aluminum frame members, not less than 2-1/2 inches wide, with mitered corners and finish to match tread-slat extrusions.
- #### C. Rubber and Vinyl Mats (Roll style): Shower mats shall be 1/2-inch- mats with beveled edges for surface applications and perforated, with non slip surface with standard spaced grid design and multidirectional drainage.(Teproflow by Tepromark Intern.) Electrical mat shall be narrow-wale corrugated top profile, and low-rib, narrow-wale corrugated bottom surface with beveled edges for surface applications. (Switchboard Runner Matting by The R. C. Musson, Rubber Co.).

## 1. Locations

- a. Shower Rooms: Vinyl Mats, as indicated on drawings. Perforated style runner mats.
- b. Electrical Rooms 1 and 2: Rubber mats, as indicated on drawings. Corrugated switchboard runner style mats conforming to ANSI/ASTM D178-77 Type 1 Class II. All rubber construction, stays in place, is slip resistant. With care, lightweight carts can be used over this runner. Meets Dielectric Test RMS AC 30,000; Proof Test Volt, Volt, RMS AC 20,000. Recommended maximum use, Volt RMS AC 17,000.

## 2.04 FABRICATION

- A. General: Verify sizes by field measurement before shop fabrication.
- B. Floor Mats: Shop fabricate units to greatest extent possible in sizes as indicated. If not otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- C. Surface-Mounted Metal Mat Frames: Tapered rigid frames fabricated from extruded aluminum and specified with floor mats in Part 2 "Floor Mats" Article, in lengths to fit floor mat type specified, for permanent surface-mounted installation, and complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.
- D. With manufacturer's standard protective coating, coat surfaces of aluminum frames that will contact cementitious material.

## 2.05 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 2.06 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

1. Color: As selected by the Commissioner from the full range of industry colors and color densities.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
- B. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.
- C. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.
- D. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

#### 3.03 PROTECTION

- A. Defer installation of floor mats until Project is near Substantial Completion.

-END OF SECTION-

**Section 12491**  
**HORIZONTAL LOUVER BLINDS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following types of venetian blinds and accessories:

1. Miniblinds with aluminum louver slats

**1.02 RELATED SPECIFICATIONS**

- A. Section 08520 - Aluminum Windows

**1.03 DEFINITIONS**

- A. Miniblind: Venetian blind with nominal 1-inch- wide louver slat.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of horizontal louver blinds. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
- C. Samples for Initial Selection: For each colored component of each type of horizontal louver blind indicated.
1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following products, prepared on Samples from the same material to be used for the Work.
1. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
- E. Window Treatment Schedule: Include horizontal louver blinds in schedule using same room designations indicated on Drawings.
- F. Product Certificates: For each type of horizontal louver blind product, signed by product manufacturer.
- G. Product Test Reports: For each type of horizontal louver blind product.

- H. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:

1. Methods for maintaining horizontal louver blinds and finishes
2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance
3. Operating hardware

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Resistance Ratings: Passes NFPA 701
- C. Corded Window Covering Product Standard: Provide horizontal louver blinds complying with WCMA A 100.1.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver blinds in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Commissioner of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Horizontal Louver Blinds, Aluminum Louver Slats:
  - a. Hunter Douglas Window Fashions
  - b. Levolor Contract; a Newell Company; Levolor
  - c. Springs Window Fashions Division, Inc.; Bali
  - d. Springs Window Fashions Division, Inc.; Graber

### 2.02 COMPONENTS

- A. Louver Slats: Aluminum, alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
1. Nominal Slat Width: 1 inch for miniblinds
  2. Nominal Slat Thickness: Not less than 0.008 inch
  3. Slat Finish: One color as indicated
    - a. Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.
- B. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and ends; capacity for one blind per headrail, unless otherwise.
1. Finish Color Characteristics: Match color, texture, pattern, and gloss of louver slats
- C. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends bottom contoured for minimizing light gaps; with enclosed and protected ladders and tapes to prevent their contact with sill.
- D. Tilt Control: Consisting of enclosed worm gear mechanism, slip clutch or detachable wand preventing overrotation, and linkage rod, for the following operation:
1. Tilt Operation: Manual with clear plastic wand
  2. Length of Tilt Control: Length required to make operation convenient from floor level



## 3. Tilt: Full

- E. Lift Operation: Manual, top-locking cord lock; locks pull cord to stop blind in either fully opened or fully closed position only and is equipped with a ring pull not more than 4 inches long.
- F. Tilt-Control and Cord-Lock Position: Right side and left side of headrail, respectively unless otherwise indicated.
- G. Ladders: Evenly spaced to prevent long-term louver sag.
  - 1. For Blinds with Nominal Slat Width 1 inch or Less: Braided string
- H. Mounting: Ceiling mounting permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
  - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.
- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard, as indicated.
- J. Colors, Textures, Patterns, and Gloss: As selected by Commissioner from manufacturer's full range.

## 2.03 FABRICATION

- A. Product Standard and Description: Comply with AWCMA Document 1029, unless otherwise indicated, for each horizontal louver blind designed to be self-leveling and consisting of louver slats, rails, ladders, tapes, lifting and tilting mechanisms, cord, cord lock, tilt control, and installation hardware.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
  - 1. Lifting and Tilting Mechanisms: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
  - 1. Blind Units Installed between (Inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
  - 2. Blind Units Installed Outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

- D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail and operating hardware, and for hardware position and blind mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
  - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Install blinds level and plumb at every window with the exception of toilets and lockers rooms and aligned with adjacent units according to manufacturer's written instructions. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.
- B. Head Mounted: Install headrail on face of opening head.

#### 3.03 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

#### 3.04 CLEANING AND PROTECTION

- A. Clean blind surfaces after installation, according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged blinds that cannot be repaired, in a manner approved by the Commissioner, before time of Substantial Completion.

-END OF SECTION-

**Section 12500**  
**FURNITURE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for furnishing and installing office furniture, accessories, and appurtenances.
- B. Furniture shall be provided, assembled as necessary, and installed where shown on the Contract Drawings or as required for a complete installation.

**1.02 SUBMITTALS**

- A. Provide all submittals, including the following, as specified in Division 1.
  - 1. Catalog Cuts: Submit complete catalog cuts with manufacturers' descriptions and information for each item of office equipment specified. Manufacturer's data substantiating that the materials comply with the requirements shall be included.
  - 2. Samples: Submit three samples of baked enamel finishes, fabrics and plastic laminate for selection and approval.

**1.03 DELIVERY, STORAGE AND HANDLING**

- A. All furniture materials and appurtenances shall be properly protected in accordance with the manufacturer's requirements so that damage or deterioration will occur from the time of shipment until installation is completed.
- B. Delivery of Materials
  - 1. Materials shall not be delivered to the project site before the time of installation.
  - 2. Materials shall be delivered in sufficient quantities to allow continuity of the Work.
  - 3. Factory assembled parts and components shall not be dismantled for shipment.
- C. Storage of Materials
  - 1. Materials shall be stored in original, undamaged containers with manufacturer's labels and seals intact.

2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow.
3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into construction systems.

D. Handling of Materials

1. Materials shall be handled carefully in order to avoid damage or breakage.
2. Materials shall not be exposed to detrimental conditions or physical damage.
3. Materials which are so exposed shall be removed from the jobsite and shall not be incorporated into the Work. If incorporated into the Work, they shall be removed and replaced, up to and including the time of final inspection, at no additional expense to the City.
4. Packages or containers shall not be opened until all necessary preparatory Work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
- B. Office Furniture
  1. Steelcase Inc., Grand Rapids, MI; Avenir Systems Furniture and Office Chairs
- C. Lunch Room Tables
  1. Maywood Furniture Corp., Maywood, NJ; Original Series folding banquet table.
- D. Lunch Room Chairs
  1. Steelcase Inc., Grand Rapids, MI; MaxStacker II, 473 Series

### 2.02 MATERIALS

- A. Office Furniture: Provide office furniture of steel construction and contemporary design and rectilinear lines with all exposed metal having a painted finish as selected by Commissioner. Top surfaces colors for desks and tables will be

selected by the Commissioner and shall be coordinated with the consoles to be installed in the operations room and foreman's office.

B. Single or Double Pedestal Desks: Where desks are shown to be furnished as a stand-alone desk, double pedestal type shall be provided. Desks shown to be furnished with returns shall be single pedestal types. Desks shall be constructed to include the following:

1. Desks shall be of thermal-fused laminate construction.
2. Work surfaces ends shall have a rounded profile.
3. Desks shall include a full-height back panel.
4. Desk pedestals shall be  $\frac{3}{4}$  height, and each shall be provided with one box drawer and one file drawer.
5. All drawers shall ride on heavy-duty ball bearing suspension glides.
6. File drawers shall be full extension type.
7. File drawers shall be equipped with a hanging file folder frame accommodating letter or legal size files.
8. Desks shall be furnished with randomly keyed locks.
9. Desks shall be furnished with plastic leveling glides.

C. Single Pedestal Returns: Returns shall be constructed to include the following:

1. Returns shall be of thermal-fused laminate construction.
2. Work surfaces ends shall have a rounded profile.
3. Returns shall include a full-height back panel.
4. Return pedestals shall be  $\frac{3}{4}$  height, and each shall be provided with one box drawer and one file drawer.
5. All drawers shall ride on heavy-duty ball bearing suspension glides.
6. File drawers shall be full extension type
7. File drawers shall be equipped with a hanging file folder frame accommodating letter or legal size files.

8. Returns shall be furnished with randomly keyed locks.
  9. Returns shall be furnished with plastic leveling glides.
- D. High-back Desk Chairs: High-back Desk chairs shall be constructed to include the following:
1. Chair shall be provided with pneumatic height adjustment with a minimum adjustment range of 5 inches.
  2. Overall height of chair shall be adjustable from 40-1/2 inches to 48-1/2 inches.
  3. Overall width of chair shall be 26-1/2 inches and the overall depth shall be 23 inches.
  4. Chair shall be a tilt tension chair and shall be provided with a variable back stop.
  5. Chair shall be provided with arms as indicated on drawings.
  6. Chair shall be provided with fabric upholstered seat, back, and outer back.
  7. Chair shall be provided with hard dual-wheel casters.
- E. Guest Chairs: Guest Chairs shall be constructed to include the following:
1. Chair shall include a sled-base frame and arms and shall be of a design complementing the specified desk chairs.
  2. Overall height of chair shall be 33 inches. Overall width of chair shall be 22-1/2 inches and the overall depth shall be 23 inches.
  3. Chair shall be provided with fabric upholstered seat, back and outer back.
  4. Chair shall be provided with hard plastic glides.
- F. Stackable Chairs: Stackable chairs shall be constructed to include the following:
1. Chair shall be provided with frame of steel finish.
  2. Chair seat and back shall be of plastic.
  3. Overall height of chair shall be 33-1/4 inches. Overall width of chair shall be 19-3/4 inches and the overall depth shall be 22-3/4 inches.
  4. Chair shall be provided with soft plastic glides.

G. Tables: Tables shall be constructed to include the following:

1. Table shall be provided with a laminate top with soft vinyl edge.
2. Table size shall 36-inches by 36-inches.
3. Table shall be provided with foldable 1-1/2 inch square, 20 gauge steel tube folding legs.
4. Table shall be provided with adjustable plastic leveling glides.

K. Other items of furniture, such as credenzas, lateral files, and the like, shall be as specified on the drawings.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. The Contractor shall verify that areas to receive furniture are properly prepared and completed. The rooms in which furniture is to be installed shall have all Work of all other trades completed so as to minimize the possibility of soil or damage to the furniture.

#### 3.02 INSTALLATION

- A. Office furniture shall be uncrated, assembled as necessary, and placed where indicated on the Contract Drawings and as directed. All crating and shipping materials shall promptly be removed and properly discarded.

#### 3.03 PROTECTION

- A. All furniture items shall be protected from soil, damage, and abuse from all other contractors and installers involved in the Work until Final Acceptance by the City.

#### 3.04 ADJUSTMENT

- A. Furniture components which are dislodged, damaged, expanded, broken, penetrated or crushed by subsequent installation operations or damaged by detrimental weather shall be immediately replaced with undamaged material in compliance with the Specifications and properly protected as specified.

#### 3.05 CLEANING

- A. After installation, furniture shall be cleaned and left in a neat condition. Units shall be cleaned using materials and processes as recommended by the manufacturer.

-END OF SECTION-



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**Section 13100**  
**LIGHTNING PROTECTION SYSTEM**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for providing, and testing of a complete lightning protection system for buildings and structures.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods
- B. Section 16060 - Grounding
- C. Section 16075 - Electrical Identification
- D. Section 16080 - Electrical Testing Requirements
- E. Section 16121 - Wires and Cables - 600 Volts and Below
- F. Section 16130 - Electrical Raceway System

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NFPA 780 - Lightning Protection Code
  - 2. UL 96 - Lightning Protection Components
  - 3. UL 96A - Installation Requirements for Lightning Protection Systems
  - 4. NYCBC - New York City Building Code

**1.04 SYSTEM DESCRIPTION**

- A. Label: Provide a master labeled lightning protection system in accordance with UL 96, 96A and NFPA 780.

**1.05 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's product data showing dimensions and materials of each component and include listing in accordance with UL 96.
  - 1. Furnish manufacturer's installation instructions.

- C. Shop Drawings: Submit Shop Drawings showing layout of air terminals, grounding electrodes, routing of conductors, and bonding connections to structure and other metal objects. Include terminal electrode and conductor sizes, connection and termination details and penetration of structures.

- 1. Furnish record drawings and documents on completion of Work as specified in Section 01332 – Record Drawings.

## 1.06 QUALITY ASSURANCE

- A. Codes: Provide lightning protection system components that are designed, manufactured and tested in accordance with the latest UL 96 standard and meet the requirements of NFPA 780, Lightning Protection Institute (LPI), and NYCBC.
- B. Regulatory Requirements: Provide a lightning protection system that is in accordance with the requirements of UL 96A and NYCBC.
- C. Installation shall be inspected and accepted by the party that will supply the Master Label for the system.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Harger Lightning Protection and Grounding Inc.
  - 2. Independent Protection Co. Inc.
  - 3. Thompson Protection Inc.
  - 4. Heary Brothers Lightning Protection Co. Inc.
- B. Standard of Quality: Label all materials used for the lightning protection system with UL factory inspection labels. The catalog numbers herein refer to the Harger Lightning Protection, Inc. numbers. The numbers are shown solely for the purpose of indicating the type and quality of equipment desired. Equivalent products of other manufacturers may be submitted for review.

### 2.02 COMPONENTS

- A. Air Terminals: Provide safety tip air terminals as follows:
  - 1. Standing Seam Roofs: Provide Cat. No. 5818ASTAT, 5/8-inch diameter and 18-inch long, solid-aluminum air terminals with ALSB standing seam bases for mounting Air Terminals on standing seam roofs with ALS12M Swivel Adaptor and two (2) SSSC2 clamps.

2. Through Roofs: Provide Cat. No. 5818ASTAT, 5/8-inch diameter and 18-inch long, solid-aluminum air terminals with Cat. No. A121 air terminal adapter and Cat. No. A1585/8-18 concealed bases for through the roof mounting.
- B. Conductors: Provide conductors as follows.
1. Main Conductors on the Roof: Provide Cat. No. A37, Class II, main conductors having 37 strands of No. 13 AWG aluminum wire weighing not less than 190 pounds per 1,000 feet.
  2. Main Conductors below Roof: Provide Cat. No. 28, Class II, main conductors having 28 strands of No. 14 AWG copper wire weighing not less than 375 pounds per 1,000 feet.
  3. Down Conductors: Within the building footprint the Building steel shall be used for this function. Where this is not suitable appropriate down conductors shall be provided.
- C. Ground Electrodes: Building and outdoor ground electrodes shall be Cat. 3410SS, ground electrodes that are 3/4-inch diameter and 10-foot long stainless-steel rods, or alternate electrodes made necessary or desirable by conditions of the site and/or construction. Any alternate must be submitted for approval.
- D. Roof Penetrations: Provide roof penetrations as follows.
1. Through-Roof/Wall Connectors: Provide Cat. No. RATW1/2BM-12 through-roof/wall aluminum to copper connectors.
- E. Accessories: Provide accessories as follows:
1. Standing Seam Conductor Clamp: Provide Cat. No. ALSC standing seam clamp with Cat No. ACC3 cable clips.
  2. Bi-metal Conductor Connector: Provide Cat. No. 211XL bi-metal lightning cable connectors.
  3. Bonding Plate: Provide Cat. No. A217, bonding plate.
  4. Ground Access Well: Provide Cat. No. 36PS12CILS80 heavy-duty PVC schedules 80 well with cast iron grated cover Cat No.12PBG.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all lightning protection system components in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1 and meeting the requirements of UL 96A, NYCBC and NFPA 780.
- B. Coordination: Coordinate with other work including roofing, exterior and interior finishing and electrical grounding and bonding as necessary to interface the installation of the lightning protection system with other work.
- C. Air Terminal Spacing: Install air terminals at intervals not exceeding 20 feet around the perimeter of flat roofs as shown.
- D. Watertight Roof Penetrations: Provide watertight roof penetrations using either concealed base for through-roof mounting of through roof/wall connector assemblies.
- E. Conductor Bases: Install all conductors on bases.
- F. Bonding: Bond all metallic bodies of appreciable size that are within six feet of the lightning protection system to the system. Bond cold water piping to the nearest down-conductor.
- G. Outdoor Lighting Standard: Ground outdoor lighting standards using copper conductors bonded to nearest available driven ground rods or structural steel.
- H. Outdoor Flag Poles: Ground outdoor flag poles using copper conductors bonded to driven ground rods.
- I. Main Conductors: Roof main conductors shall be aluminum and shall be securely supported to a vertical surface. They shall not be installed where subject to damage. In building main conductors shall be copper and shall also not be installed where subject to damage.
- J. Provide suitable dielectric protection where dissimilar metals are in contact.

### 3.02 CERTIFICATIONS AND TESTS

- A. Inspection and Certification: Furnish the services of UL for inspection and certification of the system in accordance with the provisions of UL 96A.

B. Test: Test the dry season resistance of the lightning protection system. Provide a system that does not exceed five ohms at any point of test. Provide all test equipment as specified and required.

1. Provide additional ground electrodes and/or connections to ensure the five-ohm resistance, regardless of prior shop drawing approvals of the system.

3.03 UL MASTER LABEL

A. UL Master Label: Upon completion of the installation of this system, furnish UL Master Label and deliver it to the City for attachment to the building.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 13111**  
**IMPRESSED CURRENT CATHODIC PROTECTION**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for providing complete, automatically controlled, impressed current cathodic protection system. The impressed current cathodic protection systems include but are not limited to: electrical services, disconnect switches, rectifiers, cabling, anodes and mounting hardware for all equipment. Also required under this section is the cathodic protection system supplier's design of the systems, submittals, installation, testing, start-up, commissioning and training of operations and maintenance staff.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02364 – Steel Pipe Piles
- B. Section 02390 – Fender Piles
- C. Section 02396 – Marine Fendering
- D. Section 02457 – Steel Sheet Piling
- E. Section 02920 – Soil Mixes
- F. Section 09967 – Coatings for Steel Waterfront Structures
- G. Section 16050 – Basic Electrical Materials and Methods
- H. Section 16055 – Electrical Requirements For Shop Assembled Equipment
- I. Section 16060 – Grounding
- J. Section 16075 – Electrical Identification
- K. Section 16080 – Electrical Testing Requirements
- L. Section 16121 – Wires and Cables – 600 Volts and Below
- M. Section 16130 – Electrical Raceway System
- N. Section 16411 – Disconnect Switches
- O. Section 16443 – Panelboards
- P. Section 16460 – General Purpose Dry Type Transformers
- Q. Section 16491 – Control Components and Devices

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. NEC - National Electrical Code
  - 2. NYCEC - Electrical Code for the City of New York
  - 3. NACE - National Association of Corrosion Engineer
  - 4. UL, Inc – Underwriters Laboratories, Inc.



5. NACE Standard RP0169 – Control of External Corrosion on Underground or Submerged Metallic Piping Systems

1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Design the impressed current cathodic protection system for the Southwest Brooklyn Marine Transfer Station in accordance with NACE design criteria and to protect new and existing steel sheet piling, steel fender piles and steel fender frames, steel pipe piles and all associated structural and supporting materials. Refer to Sections 02364 – Steel Pipe Piles, 02390 Fender Piles, 02396 Marine Fendering, 02457 – Steel Sheet Piling, 02920 – Soil Mixes and 09967 – Coatings for Steel Waterfront Structures for information. Design the system for a 20 year life of the anodes considering the element surfaces in the splash zone, tidal zone, submerged zone, below the mudline and in the case of sheet steel piling, the back side. To compensate for the inefficiency of the distribution current, use an efficiency factor of not greater than 70% in calculating the current requirements. Size all rectifiers and current carrying materials for 150 percent of the calculated needs.

The design of the impressed current cathodic protection system includes, but is not limited to the following design calculations, installation drawings and testing:

1. Load calculations
  2. Layout and sizing of rectifiers and cabling
  3. Routing and support for cabling
  4. Anode sizing, material selection and mounting including junction boxes
  5. System monitoring and alarms
  6. Structural bonding
  7. System testing including permanent reference electrodes and test wiring.
- B. Cathodic Protection System Design Requirements for the Southwest Brooklyn Marine Transfer Station
1. Provide a cathodic protection system for the Southwest Brooklyn Marine Transfer Station covering, but not be limited to, the following structural items:
    - a. The east bulkhead which consist of approximately 233 feet of type HZ575A and AZ26 steel sheet pilings and approximately 60 feet of type HZ775C and AZ26 steel sheet pilings.
    - b. The north bulkhead which consist of approximately 333 feet of type PZ35 steel sheet pilings.
- C. Electrical Supply: Under the Division 16 work, two 480-volt, three-phase feeders are provided to power the impressed current rectifiers at the location indicated on the E drawings.

## 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 1.
- B. Quality Control: Furnish a signed and sealed certification from a professional engineer registered in the state of New York and certified by NACE stating that the design calculations and drawings for the impressed current cathodic protection systems were prepared by that person or under his or her direct supervision.
- C. Product Data and Information: Furnish manufacturer's catalog data for the following:
  - 1. Panelboards
  - 2. Transformers
  - 3. Rectifiers
  - 4. Disconnect switches
  - 5. Electrical wire
  - 6. Electrical connections
  - 7. Anodes
  - 8. Test boxes
  - 9. Junction boxes
  - 10. Mounting hardware
- D. Shop Drawings: Furnish shop drawings showing the following:
  - 1. Complete calculations for the design of each system including anode design life and coating deterioration assumptions
  - 2. Locations, size and mounting of each anode
  - 3. Diagrams for all cabling
  - 4. Cable raceway details including mounting
  - 5. Electrical load calculations
- E. Quality Control: Submit certified test reports

## 1.06 QUALITY ASSURANCE

- 1. Codes and Standards: Construct complete corrosion protection systems in accordance with applicable NACE, ANSI, IEEE Standards and the Electrical Code for the City of New York.
- 2. Designer: The impressed current cathodic protection systems are to be designed by a NACE Certified Registered Professional Engineer with experience in the design of systems similar to that required for this project.
- 3. Installation: The installation of each cathodic protection system is to be supervised by personnel trained and experienced in the installation of such systems.

4. Testing: Submit for approval field tests and test procedures as defined by NACE that are to be conducted to verify the satisfactory performance of each cathodic protection system. After completion of a system installation, perform all proposed tests including the following. Correct any deficiencies determined during testing.
  - a. Continuity of circuits to each anode
  - b. Current flow to 20 percent of the anodes to determine conformance to the design calculations
  - c. Potential difference to a predetermined reference at 20 percent of the anodes to determine conformance to the design calculations
  - d. Input and output current at each rectifier

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.

### PART 2 PRODUCTS

#### 2.01 SYSTEM SUPPLIERS

- A. Acceptable system suppliers to design and furnish a fully functional impressed current cathodic protection system are listed below. Other equivalent system suppliers may be submitted for review.
  1. CP Masters, Inc.
  2. Corpro Companies Inc.
  3. MATCOR, Inc.

#### 2.02 RECTIFIERS

- A. Provide rectifier units with a rated input voltage of 480 volts, three phase, 60 hertz. Provide with output voltage and current rating as determined from the engineered design.
- B. Provide air cooled transformers and rectifying stacks.
- C. Provide silicon, bridge connected rectifying stacks.
- D. The DC output shall have a minimum of 25 tap adjustment bars suitable for fine tuning the output.
- E. Provide control panel with input circuit breakers, rectifier fuses, tap adjustment bars, voltmeter, ammeter and DC output terminals.

- F. Provide lightning protection both the input (AC) and output (DC) using high energy metal oxide varistor arrestors.
- G. Provide rectifiers suitable for operation in ambient of -50 degrees to 45 degrees C with natural air convection cooling.
- H. Provide NEMA 3RX (ventilated corrosion resistant) stainless steel enclosures with quick opening latches on hinged covers suitable for wall or floor mounting.

## 2.03 ANODES

- A. Provide anodes of the material type, weight and dimensions as determined for the application as determined by the engineered design.
- B. Wire to Anode Connection: Provide a special low resistance connection, completely sealed against water with a special sealing compound that forms a watertight bond with the anode surface and wire insulation.

## 2.04 ANODE AND RECTIFIER JUNCTION BOXES

- A. Provide NEMA 4X easy access fiberglass enclosures with hinged covers, stainless steel locking latches and padlockable hasp.
- B. Provide anode boxes with shunts, terminals and copper bus bars mounted on insulated interior back panels to accommodate anode wires.
- C. Provide rectifier boxes with positive and negative copper bus bars and terminals mounted on insulated interior back panels for terminating negative return structure wires, structural test wires, reference electrode wires and cables from the anode junction boxes.
- D. Provide junction boxes suitably sized to accommodate the size and quantities of conduits and conductors required by design.

## 2.05 PERMANENT REFERENCE ELECTRODE

- A. Provide permanent reference electrodes having copper/copper sulfate cells consisting of pure copper coiled elements surrounded by a super saturated solution of copper sulfate and constructed in a Schedule 80 PVC tube.
- B. Provide lead wire consisting of No. 14 AWG stranded copper conductor with type high molecular weight polyethylene, HMWPE insulation sized per the application. Route the lead wire continuous without splices from the electrode to the rectifier junction box.
- C. Solder and mechanically bond the lead wire to the copper element and thoroughly seal inside the electrode tube to prevent moisture penetration.

**2.06 CATHODIC SYSTEM WIRE AND CABLE**

- A. Provide structure negative return cables, test wires and bonding wires shall be stranded copper conductors with type high molecular weight polyethylene HMWPE insulation and sized per the application. Route the negative return and test wires continuous without splice to the rectifier junction box. Route bonding wires between points of connection on the structure continuous without splice.
- B. Anode Wires: Provide a minimum of No. 8 AWG stranded copper conductors with a dual insulation consisting of Halar polyolefin primary insulation and an external jacket of high molecular weight polyethylene, HMWPE.

**2.07 THERMITE WELDING EQUIPMENT**

- A. Provide thermite welding equipment specifically designed for the wire size and structure to be welded. All welding materials shall be a coordinated system by one manufacturer.

**2.08 BASIC ELECTRICAL MATERIALS**

- A. Branch Wiring: Provide branch wiring meeting the requirements of Section 16121 – Wires and Cables – 600 Volts and Below.
- B. Conduit, Junction Boxes and Fittings: Provide conduit, junction boxes and fitting meeting the requirements of Section 16130 – Electrical Raceway System.
- C. Disconnect Switches: Provide disconnect switches meeting the requirements of Section 16411 – Disconnect Switches.
- D. Panelboards: Provide panelboards meeting the requirements of Section 16443 – Panelboards.
- E. Dry Type Transformers: Provide dry type transformers meeting the requirements of Section 16460 – General Purpose Dry Type Transformers.
- F. Control Components and Devices: Provide all controls and equipment meeting the requirements of Section 16491 – Control Components and Devices.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. General: Install all impressed current cathodic protection system components in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1 and meeting the requirements of NACE and NEC.
- B. Coordination: Coordinate with other work including steel pipe piles, steel sheet piling, exterior and interior finishing as necessary to interface the installation of the impressed current cathodic protection system with other work.

**C. Anode Assembly Installation**

1. Install the anode assemblies at the locations shown on the impressed current cathodic protection system supplier's design drawings.
2. Exercise care in the handling of anodes so as not to damage casings, stabilizers or lead wires.
3. Support anode casings as required to prevent shifting of position due to dredging or other means of disruption.

**D. Anode Wire Installation**

1. Route anode wires from the anode assemblies in accordance with impressed current cathodic protection system supplier's design drawings requirements allowing sufficient slack to prevent tension on the wires to anode connections. Route groups of wires together.
2. Where cables are run along the river bottom, weigh the cables down in accordance with impressed current cathodic protection system supplier's design drawings to keep the cables close to the river bottom.
3. Tag each wire end with the anode number associated with each cable.
4. Route the anode wires in conduit to the anode junction boxes as shown on the impressed current cathodic protection system supplier's design drawings.

**E. Pile Bonding**

1. Bond all piles together using thermite welds performed on dry surfaces above the mean high water line in accordance with the impressed current cathodic protection system supplier's instructions.
2. Test all thermite welds for continuity and soundness and redo where found unacceptable.
3. Coat all satisfactory completed welds with a suitable mastic as recommended by the supplier of the system. Coat all exposed copper conductors and the metal surface surrounding the welded area.
4. Secure all bond wires with suitable non-metallic clips, anchors and other devices to prevent mechanical damage caused by ice, debris and wave action.
5. Structure negative return cables and test wires shall be similarly attached to piles where shown on the system supplier's design drawings.

6. Clearly identify the structure negative return cables and route in a separate conduit from the supply wires to the anode junction box and through to the rectifier junction box.

F. Sheet Pile Bonding

1. Electrically bond all adjoining sheet pile segments by attaching bonding jumpers across joints where shown on the impressed current cathodic protection system supplier's design drawings.
2. Test all thermite welds for continuity and soundness and redo where found unacceptable.
3. Coat all satisfactory completed welds with a suitable mastic as recommended by the supplier of the system. Coat all exposed copper conductors and the metal surface surrounding the welded area.

G. Reference Electrode Installation

1. Install the reference electrodes in PVC casings where shown on the system impressed current cathodic protection system supplier's drawings.
2. Position reference electrodes with the bottom of the electrode 2 feet below the mean low water line or as recommended by the impressed current cathodic protection system supplier.
3. Route the reference electrode lead wire inside the reference electrode casing and on to the anode junction box as shown on the impressed current cathodic protection system supplier's design drawings.

H. Anode Junction Box Installation

1. Mount anode junction boxes in accessible locations not subject to possible damage from vehicular or operations traffic.
2. Carefully pull and terminate anode wires on the appropriate terminals of the junction box panel. Clearly identify the anode numbers on the panel with terminations made systematically from the lowest to the highest number.

I. Main Rectifier Junction Box Installation

1. Mount the rectifier junction box adjacent to the rectifier as shown on the impressed current cathodic protection system supplier's design drawings.
2. Carefully pull, terminate and identify all wires from the anode junction boxes and negative structure connections.

3. Terminate and clearly identify structure test wires and reference electrode wires at terminals on the junction box panel.

J. Rectifier Installation

1. Install the rectifier and connect the input power supply to the unit as shown.
2. Install the positive and negative output conductors to the rectifier junction box and terminate at the positive and negative copper bus bars.

3.02 FIELD QUALITY CONTROL

- A. Tests: The entire system shall be inspected and tested in accordance with NACE Standard RP0169. The registered professional Commissioner that seals and signs the system design documents shall select the criteria for determining the adequacy of protection. Tests shall be performed by a certified corrosion protection engineer from the system supplier in the presence of the Commissioner. Any visual inspection method available may be used to verify proper installation of anodes at the station.
- B. Test and Inspection Notification: The Contractor shall notify the City of New York and the Commissioner when the systems are ready for operation. The City of New York will provide the Contractor with dates as to when the testing and inspection may begin. Upon completion of all inspections and tests, submit a detailed report for each site documenting all inspections and test results. The Contractor shall correct all deficiencies noted and arrange for the system(s) to be retested where necessary. Any additional costs are the responsibility of the Contractor. Re-submit revised final detailed reports. The final detailed reports shall include: As Built drawings for the installed systems, field testing results, discussions of the installation and recommendations for operating and maintaining the system.
- C. Training: Following completion of the installations and field testing provide training for (12) employees of the City of New York in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City of New York:
  1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
- D. Warranty: The systems supplier shall inspect, test and adjust the cathodic protection system quarterly for one year (4 inspections) to ensure continued compliance with the final detailed reports test results. The warranty period for these tests shall commence upon acceptance of the systems by the City. Ten (10)



copies of the final detailed reports certified by the corrosion protection engineer shall be provided by the Contractor to the City of New York.

**-END OF SECTION-**

**Section 13125**  
**RESIDENT ENGINEER'S FIELD OFFICE TRAILER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor shall furnish, install and equip one new Resident Engineer's field office trailer complex. The enclosed area shall be heated, air conditioned, insulated, and paneled. The total enclosed area shall be approximately 1500 square feet minimum. The field office trailer shall be fully functional before any permanent construction work commences at the site and until all work including the final project closeout procedures are completed.
- B. Electrical and Telephone Services: Installation of electrical power supply and telephone service to the trailer shall be in accordance with Section 01513 - Temporary Light and Power Facilities.
- C. At the completion of all work under this Contract as stipulated herein, subject to the approval of the engineer, the field office trailer and controls shall be removed and the facilities restored to their original condition.
- D. All costs associated with the field office trailer and controls including, but not be limited to, installation, maintenance, relocation, and removal shall be borne by the contractor at no additional cost to the owner.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01513 - Temporary Light and Power Facilities

**1.03 REFERENCES**

- A. Resident Engineer's Trailer shall comply with the latest applicable provisions and recommendations of the following:
  - 1. New York City Building Code
  - 2. New York City Electrical Code
  - 3. National Sanitation Foundation (NSF) Standard 42 (Class II)

**1.04 SUBMITTALS**

- A. Furnish all working drawings and specifications in accordance with Article 4 of the General Conditions within 14 days of the Commissioner's order to commence work.
- B. Furnish drawing showing layout of rooms and furnishings.

- C. Furnish drawing showing location of trailer on the site and location of external connections for power, telephone, water supply and sanitary drainage. Also show the enclosed areaway between the trailers.
- D. Furnish manufacturers' catalog cuts, specifications, and other data in sufficient detail for the proposed trailer and equipment to be compared to the specified requirements.

#### 1.05 MAINTENANCE AND UTILITIES

- A. The Contractor shall provide and pay in full for all electric service, heat, data communication services, telephone services for calls within New York City as well as business calls outside the City of New York limits, heat, water, and daily janitor service including mopping and vacuuming of the trailer.
- B. The Contractor shall furnish, replace and replenish electric light bulbs and fluorescent tubes, toilet paper, cloth and paper towels, soap, water, fuel and all else required to maintain the trailer in a clean and perfect condition. The trailer's floors shall be washed and waxed at least once per week.
- C. The Contractor shall furnish all office supplies, including copy paper, stationary supplies, printer cartridges, and all other supplies normally associated with the functioning of an office as required by the Resident Engineer.
- D. The Contractor shall maintain and repair the trailer and its equipment and services, as stipulated, to the satisfaction of the Commissioner during the performance of the work under this Contract and for a period of 180 calendar days after the Contract is completed as evidenced by the issuance of the Final Certificate.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURED UNITS

- A. Trailer: The Resident Engineer's trailer shall be new office type, fully insulated, approximately 60 feet long and 25 feet wide overall. The trailer shall be similar or equal to that manufactured by Miller Building Systems, 64 Hess Road, Leola, PA 17540 or by Williams Scotsman, 46 Windsor Place, Central Islip, NY 11722-3302 with the following minimum requirements:
  - 1. The exterior of the trailer and the wheel rims shall be given an approved prime coat of paint followed by one coat of approved exterior enamel. The enamel finish coat shall be DuPont Lacquer, or approved equal, color to be furnished upon award of Contract. The trailer shall be lettered on the side with black block lettering having white borders as follows or as otherwise directed by the Commissioner:

CITY OF NEW YORK  
DEPARTMENT OF SANITATION

(2-1/2" letters)  
(3-1/2" letters)

Resident Engineer's Field Office Trailer  
13125-2

RESIDENT ENGINEER'S FIELD OFFICE (2-1/2" letters)

On the front end of the trailer in block letters:

TRAILER NO. \_\_\_\_ (3-1/2" letters)

The number shall be painted in as directed.

2. All windows and doors shall have expanded metal security screens.
3. All windows shall have blinds.
4. Interior shall be finished in 1/4-inch paneling. All walls shall be insulated; interior walls shall be insulated for soundproofing.
5. The interior of the trailer shall be divided by partitions with doors as shown on the Contract Drawings. The Commissioner shall determine final dimensions for all rooms. All partition doors shall be furnished with an integral lock.
6. Lavatory
  - a. Each lavatory shall be equipped with one (1) low flow flush toilet, wash basin with faucet, a first aid kit as manufactured by Johnson & Johnson, No. JOJ 8144, or by MFASCO No. 4825, or approved equal, a paper towel dispenser and a roll toilet tissue holder for the toilet. A 6-gallon capacity under the sink type automatic electric hot water heater shall be furnished and installed in each lavatory.
  - b. A power exhaust fan shall be installed in the ceiling of each washroom. The fan shall be an 8-inch fan equal to DOMEX Model No. DX08S as manufactured by Penn Ventilation Co., North Wales, PA 19454.
  - c. A stainless steel grab bar shall be installed by each toilet for handicap use, 1-1/2 inch outside diameter, 51 inches long, fastened at ends and center to support a 250 pound load, Bobrick B-6806 Series with concealed anchors, or approved equal.
7. Plumbing and fixtures shall be approved house type. Each appliance shall be trapped and vented. The trailer shall have a single discharge connection.
8. The heating system shall consist of thermostatically controlled built-in electric baseboard heaters capable of maintaining 70° Fahrenheit temperature in all rooms when the exterior air temperature reaches 0° Fahrenheit.

9. The air conditioning units located in each room of the trailer shall be capable of maintaining a temperature of 75° Fahrenheit in all rooms when the exterior air temperature reaches 95° Fahrenheit. The units shall be installed at such a height as not to interfere with the placement of file cabinets or other furnishings.
10. The trailer shall be equipped with an armored cable wiring system conforming to the requirements of the Electrical Code of the City of New York. The wiring shall be complete with a service entrance rated, 200 Ampere circuit breaker panel. Provide a panelboard with a 200 Ampere main circuit breaker and 24 circuit capacity. Separate circuits shall be provided for lighting and the various other electrically operated items furnished by the Contractor. Circuit size shall be adequate to operate the central heating and air conditioning system, the lighting system, computers, and the copying machines. The entire trailer and electrical system shall be properly grounded.
11. Interior lighting shall be provided using 4-foot fluorescent fixtures, each with an electronic ballast and two (2) or three (3) 32-Watt T-8 lamps. Provide light fixtures that are U.S. EPA Energy Star labeled. Design light fixture layout to provide an average illumination level of 70 footcandles in the office areas and 20 footcandles in the lavatories. Fixtures located in the lavatories shall be UL Listed for damp locations. Wall switches shall be provided for all light fixtures.
12. A minimum of two (2), 120 Volt, 20 Ampere, duplex convenience receptacles shall be installed for each computer work station, four (4) duplex outlets each in the conference rooms, and one single convenience outlet in each entrance way and lavatory. These outlets shall be in addition to connections and outlets for the water heaters, kitchenette unit with appliances and the water cooler. Each receptacle in the kitchenette and lavatories shall be of the GFCI type. All outlets shall be of the grounded type.

## 2.02 EQUIPMENT

- A. Built-In Equipment: In addition to the lavatories, partitions and closets, the following items shall be built into the trailer:
  1. Security Systems: The trailer shall be provided with an approved Fire, Panic, and Intrusion alarm system. The alarm system shall be connected via the telephone service in the trailer complex to an approved central monitoring station so that continuous monitoring will be in effect.
  2. Fire System: In each of the offices in the trailer, heat detectors rated 135°F and smoke detectors shall be located in the ceiling and as close to the middle of the room as possible. The fire system shall be wired directly to a central control panel located in the field office trailer. Upon activation of the fire

system, sirens with a steady tone shall sound the fire alert. All sirens shall automatically shut down and re-arm after ten minutes.

3. Intrusion and Panic Alarm System: Each door and window in the entire trailer shall be protected so that if it is opened while the system is activated, an alarm condition will result. Upon activation of the intrusion system, sirens with a modulating tone shall sound an alert. All sirens shall automatically shut down and re-arm after ten minutes.
  - a. Panic alarm units shall be installed in two locations as designated by the Resident Engineer. When this system is activated, there shall not be a siren response; this system shall be activated in the silent mode.
  - b. A remote tamperproof turn-off switch shall be installed on the outside of the trailer at a location designated by the Commissioner so that the intrusion system can be shut down before entering the trailer. The remote turn-off switch shall not affect the fire or panic system; turn-off switches for these systems shall be located as directed by the Commissioner. The intrusion and panic system shall be connected to the central control panel located in the field office trailer.
4. Control Equipment
  - a. All wiring shall meet current standards being used in the alarm industry, and, where possible, all wires shall be hidden.
  - b. All contacts shall be recessed and moisture proof.
  - c. The single unit smoke and heat detectors shall be of a photoelectric type that provide quick response to flaming and smoldering fires and designed to permit easy entry of smoke from any direction. The heat detector portion of this unit shall be activated at 135°F. The combined unit shall also have an LED pulse located on the face of the unit to indicate that power is on. NO RADIOACTIVE materials will be permitted in this fire alarm sensor.
  - d. An 8-ohm siren shall be provided. The siren shall be installed in a tamperproof steel siren box located on the exterior of the trailer at least 10 feet above the top of the trailer roof. The external siren shall be of 30-watt capacity with two separate and distinct alarm signals for both warble and continuous tone selections so as to differentiate between fire and burglar alarm. It shall be Ademco Model No. 715 "Blaster" electronic siren in tamperproof cabinet or equal. There shall be an amber strobe light attached to or adjacent to the siren box, wired so that it is activated when the siren is activated.

- e. The control panel shall be provided and installed in the field office trailer. The control panel shall be equipped with at least three channels - one for fire, second for intrusion and third for panic. The control panel shall also have DC batteries that will supply back-up power in the event that AC power is interrupted. Each channel of the control panel shall be wired directly to a digital communicator. The control panel shall have one delay entrance exit channel. The control panel and system shall be a twelve-volt system. The control panel shall have a switch for bell/battery test and fire reset, and shall have indicating lights that indicate the mode of the:

- (1) Protective circuit
- (2) Alarm memory
- (3) AC power on
- (4) Armed

- f. The digital communicator shall be provided and installed adjacent to the control panel in the field office trailer. It shall be a type that will notify the approved central station of the specific alarm condition (fire, intrusion, or panic). The digital communicator shall also inform the approved central station of low power on the system. The Contractor shall arrange through Verizon for the necessary interconnect equipment so that the digital communication can be connected to the telephone service at the field office trailer. The connection of Verizon shall have line seizure so that the outgoing signal from the digital communicator cannot be interrupted. The current standards used by the approved central station regarding "call back to verify" alarm conditions shall be employed.

- g. Area Lighting: The Contractor shall install a minimum of four external floodlights to illuminate the Resident Engineer's trailer and surrounding walkways. They shall be activated by a photoelectric unit with a backup timer.

B. Moveable equipment shall be furnished, including the following:

1. As manufactured by the HON Company, 200 Oak Street, Muscatine, IA 52761 or approved equal:
  - a. Ten desks with locks, 60" x 30", Model No. 34962, color: walnut
  - b. Ten swivel chairs with arms, Model No. 6003, upholstered with Camel FQ26 fabric.
  - c. Ten guest chairs, Model No. 6008, Black frame and Camel FQ26 fabric.

- d. Ten book cases 72"H x 36"W and 12-5/8"D, Model No. S72ABC, color: Putty.
  - e. Seven 5-drawer lateral legal size filing cabinets with locks, Model No. HON Series 600 42" wide, color: Putty.
- 2. As manufactured by the HON Company, 200 Oak Street, Muscatine, IA 52761 or approved equal:
  - a. Two reference tables, 5'-0" x 2'-5", Product No. UTM3060, color: walnut.
  - b. Two reference tables 6'-0" x 2'-5", Product No. UTM3072, color: walnut. One for conference table and one for plan reference.
  - c. One printer table 3'-4" x 1'-8". Product No. UTM2040, color: walnut.
  - d. Fourteen waste paper baskets, 11" x 15-1/4" x 20", Blue, No. 2806, as manufactured by Rubbermaid, or 15-1/2" x 11" x 20", Black, No. 16041, by Tenex Corp., Elk Grove, IL, 60007, or approved equal.
- 3. As manufactured by Quartet or approved equal:
  - a. Two 8' x 4' white marker board with oak frame, No. S578
  - b. Two 4' x 3' corkboards with oak frame, No. 304.
- 4. Two dry chemical, 5 lb. rechargeable fire extinguishers, U.L. listed 3A-40BC, as manufactured by Atlas Fire Equipment Company, or Model No. 466143, by Kidde Safety, or approved equal.
- 5. One copying machine as manufactured by Xerox Corp., Document Centre 470ST Digital Copier with Fax Accessory, or approved equal. The Contractor shall maintain the machine for the duration of the Contract and provide all ancillary supplies.
- 6. One digital camera model Sony DSC-H10 or equal.
- 7. One laser printer, 10/100 Base-T, 1200 dpi quality, 600 x 600 dpi, 128 MB RAM, model HP 8150hn or equal.
- 8. One printing calculator with internal paper roll, equal to Monroe 7140 Heavy Duty Calculator as manufactured by Monroe Systems for Business, Inc.
- 9. One telephone system that includes twelve (12) telephone numbers with automatic switchgear, voice mail, and twelve (12) extension phones. One (1) telephone number shall be dedicated to the fax machine.



10. One desk top plain-paper, facsimile transmitter receiver, Brother Intellifax FAX4100E, or approved equal, with all necessary plugs, jacks, etc., to ensure system operation, in accordance with the manufacturer's recommendations. The Contractor shall maintain the machine for the duration of the Contract and provide all ancillary supplies.
11. Twelve (12) two-way portable radios. The units shall be Motorola T9500XLR or approved equal.
12. Provide a surge protector for each copy machine, laser printer, fax machine and two-way radio base station (total of 4). Surge protectors shall be a 7 outlet model with 480 Joules surge rating, APC model NET7 or equal.

C. Kitchenette Accessories

1. One kitchenette, sink and an 18-cubic foot refrigerator with outside water as manufactured by Frigidaire, Model No. PHT189WHS, Michigan City, IN 46360, or approved equal. It shall be installed where shown, complete with plumbing, sanitary and electric connections. Provide base cabinets, upper cabinets, and countertops as shown on the Contract Drawings.
  - a. The unit shall have a water filter. Filter shall be periodically changed per manufacturer's recommendations. The Contractor shall furnish all labor, materials, tools and equipment necessary for furnishing, installing, connecting, testing and placing into satisfactory operation, a cold water, under counter filter which utilizes its own spout. The filter shall be an Aqua-Pure AP-200 with Aqua-Pure AP-217 taste/odor cartridge, as manufactured by Cuno, 400 Research Parkway, Meriden, CT 06450, or approved equal, and conform and be listed under NSF Standard 42 (Class II). The replacement cartridges for the AP-217 are to be supplied and delivered as directed by the Commissioner.
2. Provide a dual warmer pour-over brewer coffee machine. Stainless steel cabinet, top and bottom warmers and lighted on/off switch. Manufactured by Mr. Coffee Inc., or equal.
3. One over the range microwave oven with exhaust hood, Model MH6130XE, Black, as manufactured by Whirlpool, or approved equal.
4. One 6-slice toaster oven, Black, Oster Model No. 6290, or approved equal.

**D. Computers and Associated Software**

1. The Contractor shall supply ten identical, complete personal computers, with consumable supplies and software. The computer systems shall be delivered to the Resident Engineer's Trailer at a time determined by the Commissioner. Personal computer shall meet the following minimum specifications:
  - a. Case: Mini-tower
  - b. CPU: Intel Core 2 Quad
  - c. CPU Speed: 2.4 GHz or greater
  - d. RAM: No less than 1GB ; RAM Type: SDRAM
  - e. Monitor: 19" color, flat screen, LCD type
  - f. Video Card: 128MB DDR SDRAM
  - g. Hard Disk Drive: No less than 100 GB
  - h. Optical Drive: DVD-R
  - i. Keyboard: 104-key
  - j. Point Device: PS2 Intellimouse Explorer Optical Mouse
  - k. Network Interface: 10/100 Base T
  - l. Operating System: Windows, Professional Edition, latest version
  - m. Surge Protection: 7 outlets, 480 Joules surge rating, APC model NET7, or equal
  - n. Accessories: Patch cable for network connections, 15 feet long
2. Provide the following pre-installed software with each personal computer:
  - a. Microsoft Office, Professional Edition, latest version
  - b. Microsoft Internet Explorer, latest version
  - c. Microsoft Outlook, latest version
  - d. Microsoft Net Meeting, latest version
3. Provide personal computer systems from the following manufacturers:
  - a. Gateway
  - b. Dell
  - c. Hewlett Packard
  - d. Or equal
4. Additional Software: Provide the following software licenses:
  - a. Ten pack client licenses for Microsoft Exchange
  - b. Ten pack user licenses for Lexign Icxpertflow (Keyflow software)
5. Maintenance and Support: The Contractor shall furnish for the duration of the Contract, a renewable service contract for on-site maintenance of all hardware and software. The maintenance response time for the hardware and software shall be not more than 24 hours from the time of notification of a

service related problem. The Contractor shall furnish any item inadvertently omitted from this specification that is required to insure the proper operation of the personal computer system and software as specified above.

6. Each trailer shall be wired with Cat 6 cable to a centrally located patch panel adjacent to the telephone peripheral node and connected to a new Ethernet switch provided with telephone system and fiber optically connected to all other trailers switches.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

##### A. Trailer Installation

1. Trailer shall be located and installed as shown on the contract drawings.
2. Concrete block foundation walls and concrete footings shall be constructed as directed. The walls and footings shall completely enclose the bottom of the trailer and shall extend below the frost line. Wood stairs, platform and railing shall be constructed at each door.
3. Trailer shall be placed on a concrete pad as shown.
4. All exterior items not factory painted shall be painted by the Contractor as directed by the Commissioner.

##### B. Trailer Services

###### 1. Plumbing

- a. Plumbing work shall include all water supply, drainage, pumping, and piping required for a complete operating installation. A temporary water service shall be provided from the existing water main and extended into the trailer, and all fixtures requiring water supply shall be properly connected. All necessary soil, waste, vent, and drainage piping shall be provided and connected to the existing plant sewer system.
- b. All water pipes shall be frost proofed with heat tracing to prevent freezing.
- c. The plumbing work shall be maintained and shall be repaired when and as directed by the Commissioner and as required, and kept in perfect condition during the performance of the work under the Contract.

2. Heating and Air-Conditioning Systems

- a. The Contractor shall place in operation and maintain the entire central heating system and air conditioning units for the trailer.
- b. The central heating system and air conditioning units shall be maintained, repaired and kept in perfect condition during the performance of the work.

3. Computers and Associated Software

- a. Install each item in accordance with the manufacturers' recommendations and in accordance with the Contract Documents.
- b. Provide all supports, bracing, wiring, and incidental hardware required for a complete and sound installation.
- c. All software required for these units shall be loaded, configured and fully tested as part of this contract. Provide all drivers required to connect to the network.

-END OF SECTION-

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

NO TEXT ON THIS PAGE

**Section 13287****ENVIRONMENTAL WASTE TRANSPORTATION AND DISPOSITION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for transportation and disposition of waste materials generated as a result of the environmental remediation work.
- B. Recordkeeping requirements.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01355 – Regulated Materials Control
- B. Section 01356 – Safe and Healthful Working Conditions
- C. Section 01733 – Construction Waste Management
- D. Section 02225 – Impacted Soil Handling
- E. Section 02316 – Excavation

**1.03 PAYMENT**

- A. All costs associated with the characterization, profiling, disposal acceptance, regulatory compliance, loading, containerizing, transportation, and disposition of the environmental waste materials, including excavated materials, shall be borne by the Contractor and shall be included in Contractor's lump sum bid price for Bid Item 1.
- B. Final payment shall not be made if the copies of manifests, bills of lading, and certificates of disposal/recycling/reclamation are not received by the City of New York for all wastes transported offsite.

**1.04 DEFINITIONS**

- A. Environmental waste shall mean waste generated as a result of implementing the environmental remediation work identified in the related specifications.

**1.05 WORK SPECIFIED**

- A. The Contractor shall provide all labor, equipment, materials, and services necessary to characterize, profile, load, containerize, transport, and dispose of/reclaim/recycle all waste materials generated during implementation of the environmental remediation work. Such materials include, but may not be limited to, fluorescent and HID lamps, fluorescent and HID lamp ballasts, refrigerant, mercury-containing devices, batteries, containerized chemicals, various oils, asbestos-containing materials (ACMs), loose paint, bird excrement, arsenic impacted wood, microwave ovens, disposable equipment and personal protective equipment (PPE),

decontamination waste, and staging/decontamination area construction materials. This Section does not include dredge spoil which is covered in Section 02325 - Dredging and Dredged Material Disposal.

- B. The Contractor shall provide all labor, equipment, materials, and services necessary to profile, load, transport, and dispose of excavated material.

#### 1.06 MINIMUM EXPERIENCE REQUIREMENTS

- A. The entity performing the work under this section must demonstrate at least three (3) years of experience in waste transportation and disposition.

#### 1.07 RESPONSIBILITIES

- A. The Contractor shall be directly responsible for compliance with all applicable federal, state, and local laws, rules, and regulations governing the storage, handling, manifesting, transportation, and disposal/reclamation/recycling of waste materials generated as a result of work activities under the Contract.

#### 1.08 SUBMITTALS

- A. At least 30 calendar days prior to the commencement of the environmental waste transportation and disposition work, the successful Contractor shall submit the following items for review in accordance with the requirements specified in Section 01355 - Regulated Materials Control:
  - 1. Estimated quantities of each type of waste material to be generated as a result of the environmental remediation work specified in the following Sections, and anticipated number and type of containers to be utilized to transport each waste stream.
    - a. Section 01355 – Regulated Materials Control
    - b. Section 02225 – Impacted Soil Handling
    - c. Section 02316 - Excavation
  - 2. Inaccuracies in the Contractor's estimate will not entitle the Contractor to additional compensation under this Contract.
  - 3. A list of proposed transporters for all waste materials generated during implementation of the environmental remediation work and for surplus excavated materials that require offsite disposal (if any). All transporters must possess a valid transporter permit for handling the waste(s), as applicable.
  - 4. A list of disposal/reclamation/recycling facilities for all anticipated environmental waste streams (i.e., regulated/hazardous materials) and for excavated materials that require offsite disposal. All

disposal/reclamation/recycling facilities must be permitted in accordance with applicable regulations.

- B. Submit executed copies of waste manifests, bills of lading and verification of disposal/recycling/reclamation within 30 days of disposal/recycling/reclamation.

## PART 2 PRODUCTS

### 2.01 CONTAINERS

- A. The Contractor shall provide United States Department of Transportation-(USDOT-) approved containers for containerizing all waste materials generated as a result of the environmental remediation work. If the containers are to be disposed with the waste they contain, the Contractor shall include costs for such containers in its bid.
- B. The Contractor shall provide USDOT-approved containers for containerizing surplus excavated materials that require offsite disposal (if any).
- C. All containers shall be labeled by the Contractor in accordance with applicable laws, rules, and regulations.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. All environmental waste streams and excavated materials shall be transported to disposal/reclamation/recycling facilities that are permitted to accept such types of waste. The disposal/recycling/reclamation facilities shall be proposed by the Contractor and reviewed by the Commissioner. Review by the Commissioner will not release the Contractor from its obligation to comply with all applicable laws, rules, and regulations and shall not constitute a relief from the requirements of the Contract.

### 3.02 DISPOSITION OF MATERIALS

- A. The following materials shall be transported for offsite disposal/recycling/reclamation by the Contractor:
  - 1. ACMs
  - 2. Loose paint chips. The loose paint collected from the transfer station shall be handled and disposed as a Resource Conservation and Recovery Act (RCRA) hazardous waste due to assumed lead and cadmium toxicity (EPA hazardous waste numbers D008 and D006, respectively).
  - 3. Bird excrement



4. Fluorescent and HID lamps. All fluorescent and HID lamps shall be disposed of as a RCRA hazardous waste due to assumed mercury and lead toxicity (EPA hazardous waste numbers D009 and D008, respectively). The Contractor may elect to manage the fluorescent and HID lamps as a universal waste within states that have adopted the United States Environmental Protection Agency's (USEPA's) Universal Waste Rule.
5. Lamp ballasts. Leaking PCB-containing (or assumed to be PCB-containing) ballasts and any material that comes in contact with leaking material shall be transported to a Toxic Substance Control Act- (TSCA-) compliant incinerator for disposal. Intact, non-leaking ballasts shall be disposed of in accordance with applicable regulations.
6. Mercury-containing devices. All mercury-containing devices shall be disposed of as a RCRA hazardous waste due to assumed mercury toxicity (EPA hazardous waste number D009). The Contractor may elect to manage the mercury-containing thermostats as a universal waste within states that have adopted the USEPA's Universal Waste Rule.
7. Refrigerants. Used chlorofluorocarbon (CFC) refrigerants from totally enclosed heat transfer equipment are excluded from hazardous waste regulations, provided the refrigerant is reclaimed for future use. CFC refrigerants recovered from air conditioning (AC) units, drinking water fountains, beverage vending machines, and refrigerators shall be transported to a reclamation facility.
8. Various oils
9. Microwave ovens
10. Containerized chemicals
11. Decontamination waste (including liquid and solid decontamination waste) and decontamination areas.
12. All other wastes generated during implementation of the environmental remediation work.
13. Regulated/hazardous wastes generated during implementation of non-environmental remediation activities (i.e., general construction).
14. Excavated materials
15. Arsenic-impacted wood. Arsenic-impacted wood (i.e., wood that failed the Toxicity Characteristic Leaching Procedure [TCLP] test for arsenic) shall be disposed of as a hazardous waste at a Subtitle C (hazardous) waste disposal facility.

- B. Should minimal demolition of building components (e.g., suspended ceilings, interior partition walls) be required during the performance of the pre-demolition environmental remediation activities (i.e., to gain access to regulated/potentially regulated materials/equipment that shall be addressed prior to initiating the transfer station demolition activities), the Contractor shall move and stage demolition debris generated as a result of such minimal demolition activities. Location of the demolition debris staging area(s) shall be proposed by the Contractor and reviewed by the Resident Engineer. The demolition debris staging area(s) shall be located onsite in area(s) sheltered from the elements (e.g., building interior) to minimize the potential for dispersing the debris by erosion and wind forces.

### 3.03 RECORD KEEPING

- A. The Contractor shall be responsible for waste characterization and profiling of the environmental waste materials. All disposal-associated documentation for the environmental waste shall be submitted to the Commissioner for review prior to submittal to the disposition facility.
- B. The Contractor shall prepare the waste manifests and bills of lading for the transport and offsite disposal/reclamation of all environmental waste materials. The DSNY and/or the Resident Engineer will review, and sign the waste manifests and bills of lading as Generator of the waste, prior to offsite transport of waste materials. The following address shall be specified as a "Waste Generator" on the manifests and bills of lading:

New York City Department of Sanitation  
Bureau of Long Term Export – Engineering Unit  
44 Beaver Street, 7<sup>th</sup> Floor  
New York, New York 10004  
Telephone: (212) 437-4520

- C. Modifications to waste profiles, manifests, bills of lading, or any other associated documentation shall be made by the Contractor at the request of the DSNY and/or the Commissioner at no additional cost to the City of New York.
- D. The Contractor shall coordinate with disposal/recycling/reclamation facilities for a timely receipt of executed copies of hazardous waste manifests, non-hazardous waste manifests, bills of lading, and certificates of disposal/recycling/reclamation and shall provide original copies of these documents to the DSNY to the address specified in Paragraph 3.03B of this Section for all environmental wastes transported offsite. In addition, the Contractor shall submit copies of the above-referenced documents to the Resident Engineer. Copies must be received within 30 days of disposal/recycling/reclamation.
- E. The Contractor shall submit executed copies of the waste manifests, bills of lading, and verification of disposal/recycling/reclamation to the Resident Engineer to assure proper project close-out and final payment.

- F. The Contractor shall be responsible for providing the generator state (i.e., New York State) and disposal state (if different than New York) with executed copies of hazardous waste manifests, as required.

3.04 POST-WASTE SHIPMENT ACTIVITIES

- A. Any disposable material not used or shipped offsite during waste shipment operations (e.g., paper, food containers) that have not come in contact with impacted site materials shall be placed into a Contractor-provided sealable container, removed from the site, and properly disposed of by the Contractor at no additional cost to the City of New York.

3.05 HEALTH AND SAFETY PROTOCOLS

- A. The Contractor shall comply with all applicable federal, state, and local regulations, including, but not limited to, Occupational Safety and Health Administration regulations, during the implementation of the work. The work described in this Section shall be conducted in accordance with the Contractor's site-specific Health and Safety Plan, which is described in Section 01356 – Safe and Healthful Working Conditions.

-END OF SECTION-

**Section 13851**  
**FIRE ALARM AND DETECTION SYSTEM**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Furnish and install a complete fire alarm and detection system including fire alarm control panel, printer, fire alarm annunciator panel, purge panel, fan control panels, signal initiating devices, notification devices, raceways, boxes, wires and cables.

**1.02 RELATED SPECIFICATIONS**

- A. Section 08331 - Overhead Coiling Doors
- B. Section 11141 - Diesel Fuel Dispensing System.
- C. Section 13915 - Fire Suppression Piping.
- D. Section 13921 - Electric Drive, Centrifugal Fire Pumps
- E. Section 13953 - Foam-Water Fire Suppression System
- F. Section 15900 - HVAC Controls
- G. Section 15820 - Ductwork Accessories
- H. Section 16050 - Basic Electrical Materials and Methods
- I. Section 16121 - Wires and Cables - 600 Volts and Below
- J. Section 16130 - Electric Raceway System
- K. Section 16411 - Disconnect Switches
- L. Section 16415 - Automatic Transfer Switches
- M. Section 16443 - Panelboards
- N. Section 16491 - Control Components and Devices

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. NYCBC - New York City Building Codes
  - 2. NFPA 72 - National Fire Alarm Code
  - 3. NFPA 90A - 1999 Air Conditioning Systems
  - 4. NFPA 101 - Life Safety Code
  - 5. UL 864 - Control Units for Fire Protective Signaling Systems
  - 6. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
  - 7. UL 268A - Smoke Detectors for Duct Applications
  - 8. UL 464 - Audible Signaling Appliances
  - 9. UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
  - 10. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
  - 11. UL 1971 - Signaling Devices for the Hearing-Impaired
  - 12. UL 1481 - Power Supplies for Fire Protective Signaling Systems
  - 13. FM - Factory Mutual Approval

14. OTCR - Office of Technical Certification and Research (NYC)
15. Federal Codes and Regulations
16. (ADA) - Americans with Disabilities Act
17. Rules and Regulations of the NYC Fire Department

#### 1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in Division 1:

1. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the Contract Documents. In addition the Contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.
2. All drawings and diagrams shall include the Contractor's title block, complete with drawing title, Contractor's name, address, date including revisions, and preparer's and reviewers initials

B. Product Data: Manufacturer data sheets indicating the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Commissioner. No product data will be reviewed for any substitution before the floor plans referenced in C4 below are received.

C. Shop Drawings: A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

1. Control panel wiring and interconnection schematics
2. Complete point to point wiring diagrams
3. Riser diagrams
4. Complete floor plans locating all system devices as well as raceway size and routing, junction boxes, conductor size, quantity, and color in each raceway.
5. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.
6. Complete system bill of material
7. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET certification in fire protection engineering technology, sub-field of fire alarm systems. This signoff shall indicate correctness of the proposed installation for the purpose intended by this specification. It will

also verify the proposed installation conformance to applicable codes and standards.

- D. Samples: A sample of each device - smoke and heat detector, intelligent modules, horn, strobes, and manual pull stations shall be provided to the City for its familiarization.
- E. Installer's Certification: The engineered systems distributor must be licensed in the State of New York and have been incorporated in the business in that state for a minimum of three (3) years. Submit a copy of the installer's training certification issued by the manufacturer of the system. Installers shall be licensed with the State of NY. Provide a copy of the installing technician's NICET certification.
- F. Complete calculations shall be provided which show the electrical load on the following system components:
  - 1. Each system power supply, including stand alone booster supplies
  - 2. Each standby power supply (batteries)
  - 3. Each notification appliance circuit
  - 4. Each auxiliary control circuit that draws power from any system power supply
- G. The close out submittals shall include:
  - 1. Project specific operating manuals covering the installed system. A generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
  - 2. As-Built drawings and information consisting of scaled plans of each building describing and depicting the entire system(s) as installed, including all information necessary for maintaining, trouble-shooting, and/or expanding the system(s) at a future date.
  - 3. Complete documentation of system(s) testing. Certification that the entire system(s) has/have been inspected and tested, is installed entirely in accordance with the applicable codes, standards, rules and regulations of the New York City Fire Department, manufacturer's recommendations and UL listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by NFPA 72 - 2002 edition as per the NYC Building Code modifications.
  - 4. Name, address and telephone of the authorized factory representative.

## 1.05 QUALITY ASSURANCE

### A. Qualification of Installers

1. The installer shall have successfully installed similar system fire detection, signaling control components on a previous project of comparable size and complexity.
2. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and operating manuals. The Contractor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

- B. Pre-installation Requirements: All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the manufacturer's riser/connection diagram and details for all specific system installation/termination/wiring data.

## 1.06 SYSTEM DESCRIPTION

### A. General

1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional NYC code compliant and approved fire alarm system. The system shall comply in respects with all pertinent codes, rules, regulations and laws of the local jurisdiction, the NYC Building Code and all rules and regulations of the New York City Fire Department. The system shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (UL) listings.
2. Provide and install a new fire detection and alarm system that shall consist of:
  - a. Fire Alarm Control Panel located as shown on the Contract Drawings.
  - b. LCD remote annunciator panel located as shown on the Contract Drawings.
  - c. Manual pull stations located as shown on the Contract Drawings.
  - d. Area smoke and heat detectors located as shown on Contract Drawings.

- e. Duct smoke detectors located as shown on the Contract Drawings.
- f. Smoke vent detectors and control where indicated on Contract Drawings.
- g. Sprinkler system waterflow, pressure, valve supervisory and alarm switches located as shown on the Contract Drawings.
- h. Audible notification appliances located as shown on the Contract Drawings.
- i. Synchronized visual notification appliances located as shown on the Contract Drawings.
- j. Overhead door related fire detection system.
- k. Fan control relays and control panels
- l. Connection to a central station. The City of New York shall arrange for two dedicated phone lines to be terminated as directed by the Contractor.

**B. Sequence of Operations**

- 1. Upon alarm activation of any area smoke detector, manual pull station, fire door heat sensor, deluge system release or sprinkler water flow device the following functions shall automatically occur:
  - a. The internal audible device shall sound at the control panel and remote annunciator.
  - b. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
  - c. All system activity/events shall be documented in system history and on the system printer.
  - d. Any remote or local annunciator LCD/LEDs associated with the alarm shall be illuminated.
  - e. Activate notification audible appliances
  - f. Activate visual strobes notification appliances. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.



- g. Transmit an alarm signal to the central station.
- h. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
- i. A signal shall be sent to the building access control (security) system to unlock all stairwell/exit doors throughout the building over which it has control.
- j. All self-closing fire/smoke doors held open shall be released.
- k. A signal shall be sent to the building Temperature Control Panel (A-TCP-01) and to the Motor Control Centers in Electric Rooms 1 & 2 to shut down fans. Also send a signal to the building SCADA System.

C. Supervisory Operation

- 1. Upon supervisory activation of any sprinkler valve supervisory switch, duct, smoke vent or stair shaft smoke detector, fire smoke damper, Fire Pump monitoring function or Engine Generator Enclosure fire detection device, the following shall automatically occur:
  - a. The internal audible device shall sound at the control panel and remote annunciator.
  - b. The LCD display shall indicate all applicable information associated with the supervisory condition including; device type, device location and time/date.
  - c. All system activity/events shall be documented on the system printer and system history file.
  - d. Any remote or local annunciator LCD/LEDs associated with the supervisory activation shall be illuminated.
  - e. Transmit a supervisory signal to the central station.
  - f. The Temperature Control Panel (F-TCP-01) and SCADA System shall be notified which fan the activated detector is monitoring – so it may be shut down.

D. Trouble Operation. Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:

- 1. The internal audible device shall sound at the control panel and remote annunciator.

2. The LCD display shall indicate all applicable information associated with the trouble condition including; device type, device location and time/date.
  3. All system activity/events shall be documented on the system printer and system history file.
  4. Any remote or local annunciator LCD/LEDs associated with the trouble zone shall be illuminated.
  5. Transmit a trouble signal to the central station.
- E. Monitor Activation. Upon activation of any device connected to a monitor circuit, the following functions shall automatically occur:
1. All system activity/events shall be documented on the system printer.
  2. The monitor LED will light and pre-programmed functions will activate.
- F. System Configuration
1. All system equipment shall be arranged and programmed to provide a system for the early detection of fire, the notification of building occupants, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.
  2. The system shall utilize independently addressed smoke detectors, heat detectors and input/output modules as described elsewhere in this specification.
  3. The system shall include a printer located where indicated on the Contract Drawings to record all events and facilitate maintenance of the system.

## 1.07 WARRANTY AND MAINTENANCE

- A. The system supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the City of New York notifying the Contractor.

## 1.08 SPARE PARTS

- A. The Contractor shall supply the following spare parts:
1. Smoke detectors - Ten (10) percent of the installed quantity of each type, but no less than four (4) devices.
  2. Manual fire alarm stations - Ten (10) percent of the installed quantity of each type, but no less than two (2) devices.

3. Glass rods or panels for break glass manual fire alarm stations - Ten percent of the installed quantity, but no less than twelve (12) devices.
  4. Audible and visible devices - Ten (10) percent of the installed quantity of each type, but no less than four (4) devices.
  5. Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.
  6. Two complete replacements for each indicator lamp.
  7. Two complete replacements for each fuse.
- B. Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

#### 1.09 ENVIRONMENTAL CONSIDERATIONS

- A. All devices, controls and panels with printed circuit board components shall have that component conformal coated, wherever it is located in a place where the environment would be otherwise deleterious to same.
- B. All equipment shall be suitable for application in the environment where it will be located.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below.
1. The fire alarm system specified is manufactured by Simplex/Grinnell, any Catalog or model number is intended to establish the type and quality of equipment and system design as well as exact operating features required. Other manufacturers are:
    - a. Fenwal/FCI
    - b. Notifier
    - c. Siemens Building Technologies
    - d. Or approved equal

## 2.02 FIRE ALARM CONTROL PANEL

## A. General

1. The fire alarm control panel shall be a multi-processor-based designed specifically for fire and releasing system applications. The control panel shall be listed and approved for the application standard(s) listed above.
2. The control panel shall include all required hardware, software and system programming to provide a complete and operational system. The control panel shall assure that life safety takes precedence among all panel activities.
3. The control panel shall include the following capacities:
  - a. Support up to 380 analog/addressable points per panel
  - b. Support up to 5 fully supervised network remote annunciators.
  - c. Support a DACT (dialer) for off premise notification
  - d. Support up to 576 chronological events in history.
  - e. Support notification of individual duct smoke detector alarms to fan control panels
  - f. Support General Fan Shutdown alarm notice to MCCs and TCPs.
4. The control panel shall include the following features:
  - a. Provide auto programming and electronic addressing and mapping of analog/addressable devices.
  - b. Provide an operator interface display that shall include functions required for annunciation, command and control system functions.
  - c. Provide a discrete system control switch provided for reset, alarm silence, local silence, drill switch, up/down switches, status switch, program switch, enable and disable switches, activate and restore switches, reports switch and test switch.
  - d. Provide system reports that provide sensitivity and history details.
  - e. Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords; and autoprogram, enable mapping, restart the system and clear control panel event history file.

- f. Provide an authorized operator to perform test functions within the installed system.
- g. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure.

**B. Annunciation**

- 1. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the building. Manufacturer's standard control switches shall be acceptable if they provide the required operation, including performance, supervision and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the City of New York is required.
- 2. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device.

**C. Power Supply**

- 1. Each system power supply shall be a minimum of 6 amps @ 24 vdc. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 4.5A continuous for notification appliance circuits.
- 2. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 6.4 continuous for notification appliance circuits. The power supply shall be capable of providing 8A to output circuits for a maximum period of 100 ms. All outputs shall be power limited.
- 3. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any alarm, trouble or operator acknowledgment signals.
- 4. Each system power supply shall be individually annunciated and shall identify the inoperable power supply in the event of a trouble condition.

5. All standby batteries shall be continuously monitored by the system. Low battery and disconnection of battery power supply conditions shall immediately annunciate as a trouble signal, identifying the deficient batteries.
6. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
7. All AC power connections shall be connected to the FCO panel that supplies the Building Wide Alarm Systems (BWAS) of the building. All wiring and equipment shall meet the requirements of the NYCEC, the regulations of the New York City Fire Department and other referenced codes and standards. All AC power circuits shall be installed in steel raceway and shall contain a #10AWG grounding conductor as a minimum. All power disconnect switches in the AC service (Disconnect Switches, Transformers, Automatic Transfer Switches) shall be clearly labeled "Fire Alarm System". The power circuit disconnect means shall be clearly labeled and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel.

#### D. Display

1. The display module shall be of membrane style construction with a 4 line by 20-character Liquid Crystal Display. The LCD shall use super-twist technology and backlighting for high contrast visual clarity. In the normal mode display the time, the total number of active events and the total number of disable points. In the alarm mode display the total number of events and the type of event on display. Reserve 40 characters of display space for user custom messages. The module shall have visual indicators for the following common control functions; AC Power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail, and test.
2. There shall be common control keys and visual indicators for; reset, alarm silence, trouble silence, drill, and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward / backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicator that lights when an event of its type is active. Allow the first event of the highest priority to capture the LCD for display so that arriving fire fighters can view the first alarm event "hands free". Provide system function keys; status, reports, enable, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.

E. System Message Processing and Display Operations

1. The system shall allow message routing to be configured to any or all annunciators.
2. All system printer port shall be configurable to output any combination of alarm, supervisory, trouble, or monitor, event messages.
3. Each LCD display on each annunciator shall be configurable to display the status of any combination of alarm, supervisory, trouble, or monitor, event messages.
4. Clear distinction shall be provided between alarm, supervisory, trouble, and monitor status messages.
5. The system shall provide the ability to retrieve data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The uploaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
6. A standby power supply shall automatically supply electrical energy to the system upon primary power supply failure.

F. Dialer - DACT: The system shall provide an off premise Digital Alarm Communications Transmitter (DACT) capable of transmitting system alarm, trouble and supervisory events to a central monitoring station (CMS). The DACT shall support dual telephone lines, 20 PPS 4/2 communications, and configured for dual tone multi-frequency (DTMF) or pulse modes. It shall be possible to delay AC power failure reports, auto test call, and site program the DACT using a touch tone phone and password.

G. Field-Mounted System Components

1. Initiating Devices

- a. General: The initiating device circuits (SLC) used to monitor manual fire alarm stations, heat and smoke detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class A (Style "D" or "E").

b. Smoke Detectors & Accessories

(1) Analog Addressable Smoke General

- (a) Each smoke detector shall be addressable intelligent type with a unique address. An intelligent microprocessor shall analyze and compare sensed data to historical

readings and time patterns to make an alarm decision. A digital filter shall remove patterns not typical of fires to prevent unwanted alarms.

- (b) The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, dirt, temperature, and humidity. Self-diagnostics shall automatically send a message if the detector is dirty or requires maintenance. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal that 80% to 99% compensation has been used. The detector shall provide a dirty fault signal that 100% compensation has been used.
  - (c) Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. An alternate alarm sensitivity level shall be provided for each detector, which can be set to any of the five (5) sensitivity settings manually or automatically using a time of day event.
  - (d) The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.
- (2) Smoke Detector – Photoelectric: Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. The system shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting alarm signals as well as normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and



sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value.

- (3) Duct Detector Housing: Provide smoke detector duct housing assemblies to mount an intelligent analog/addressable duct smoke detector as specified above along with a standard detector mounting base. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be finished in baked red enamel. Remote alarm LED indicators and remote test stations shall be provided.
  - (4) Detector Bases: Provide standard detector mounting bases suitable for mounting on either, North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The base shall, contain no electronics and support all series detector types.
- c. Manual Station - Single Action Single Stage: Provide analog/addressable single action, single stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of metal construction and incorporate an internal toggle switch. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on North American 2½ (64mm) deep 1-gang boxes and 1½ (38mm) deep 4 square boxes with 1-gang covers.
- d. Heat Detectors and Accessories
1. Each heat detector shall be addressable intelligent type with a unique address. An intelligent microprocessor shall analyze and compare sensed data to historical readings and time patterns to make a maintenance advisory.
  2. Heat detectors shall be fixed temperature/rate of rise design of a rating suitable for the area protected.
  3. Detector Bases: Provide standard detector mounting bases suitable for mounting on either, North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang

box. The base shall, contain no electronics and support all series detector types.

2. Notification Appliances

a. General

- (1) All appliances which are supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "equivalent facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.
- (2) All appliances shall be of the same manufacturer as the fire alarm control panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions.
- (3) Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended. All strobes shall be provided with lens markings oriented for wall mounting. All notification appliances shall be red.
- (4) 24 VDC Notification appliance circuits (NAC) shall be Class B (Style "Z"). All notification appliance circuits shall have a minimum circuit output rating of 2 amp @ 24 vdc. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.
- (5) One-way audio notification appliance circuits (NAC) shall be Class B (Style "Z"). All notification appliance circuits shall have a minimum circuit output rating of 35W @70Vrms. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

- b. Horn-Strobes: Provide wall-mounted horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices.

The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Horn/strobes shall mount in a North American 1-gang box. Horn/strobes in process areas of the facility shall be waterproof type.

- c. Strobes: Provide wall-mounted strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Strobes shall mount in a North American 1-gang box.

### 3. Initiation and Control Modules

- a. Relay Module: Addressable control relay circuit modules shall each provide one (1) form C dry relay contact rated at 24Vdc @ 2 amps (pilot duty) to control external fans, appliances or equipment.
- b. Addressable Input Module: Intelligent addressable input modules shall be provided for connection of dry contact type waterflow, pressure, overhead coiling door fire safety devices and tamper switches to initiating device circuit of the fire alarm control panel. They shall also provide fan control information to TCP and MCCs.
- c. Notification Appliance Circuits: Provide addressable notification appliance circuit modules at the locations shown on the drawings. The module shall provide one (1) supervised Class B notification circuit. The module shall provide polarized audible / visual selection for 24Vdc @ 2amps, audio outputs at 25Vrms @ 50 watts or 70 Vrms @ 35 watts.

## H. CIRCUITING

### 1. Signaling Circuits

- a. The signaling line circuit shall communicate from a panel/node to analog/addressable detectors, input modules, output modules, isolation modules and notification appliance circuits.
- b. Each signaling circuit connected to addressable/analog devices shall provide a minimum of 20 spare addresses.
- c. When a signaling line circuit covers more than one fire/smoke compartments, a wire-to-wire short shall not effect the operation of the circuit from the other fire/smoke compartments.

- d. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, and notification circuit modules shall be Class A (style 6 or 7).
- e. These circuits shall serve a maximum of one floor of the building.

## 2. Notification Appliance Circuits

- a. Provide addressable notification appliance circuit modules where required.
- b. The module shall provide supervised Class B notification circuit.
- c. The module shall provide polarized audible/visual selection for 24 volt DC @ 2 amps, audio outputs at 25 volts rms @ 50 watts or 70 volt rms @ 35 watts.
- d. Adjacent devices shall be wired to alternate circuits such that a failure of one circuit does not leave an area without coverage.

## 2.03 PURGE PANEL

- A. A purge panel shall be provided to allow for fan purging by the Fire Department. The purging operation shall be manual to allow independent fan operation. The purging shall occur only when activated by fire department personnel from a master key switch. The purge panel shall include all devices required to provide a complete operating system.
- B. The purge panel shall include, but not be limited to the following front panel mounted devices:
  - 1. Master key switch with a 1620 key cylinder
  - 2. ON-OFF Selector switches, one for each supply fan, exhaust fan and return exhaust fan as shown
  - 3. Running red LED type indicating light, one for each supply fan, exhaust fan and return exhaust fan as shown
  - 4. Graphic depiction of the transfer station indicating the areas served by each supply fan, exhaust fan and return exhaust fan controlled by the purge panel
- C. The purge panel shall include, but not be limited to the following internally mounted devices:
  - 1. Control relays

## 2. Terminals

- a. All catalog numbers refer to Phoenix Contact Type for the purpose of establishing the standard of quality and general configuration desired. Equivalent products of other manufacturers may be submitted for approval.
  - b. Provide symmetrical type steel mounting rails, DIN-EN50022.
  - c. Control and Alarm Signals: Provide terminals suitable for wires from 30 to 10 AWG rated 18 amperes at 600 volts, blue body, Phoenix Contact Type UK5N BU.
  - d. 120-Volt Power Wiring: Provide terminals suitable for wires from 18 to 10 AWG rated 30 amperes at 600 volts, hot (black body), neutral (white body), ground (green body), Phoenix Contact Type UK5N BK, UK5N WH & UK5N GN, respectively.
- D. Provide all relays, selector switches and indicating lights as specified in Section 16491 – Control Components and Devices.
- E. Panel shall be constructed to meet the requirements of the NYC Fire Department and shall be suitable for the location and environment where it is installed.

### 2.04 FAN CONTROL PANELS

- A. Provide fan control panels at the locations indicated on the Contract Drawings. Generally they are located at each of the three (3) MCCs and the TCP.
- B. Panels shall contain relays and power supplies needed to provide fan shutdown when directed by intelligence from the Fire Alarm Control Panel.
- C. Panel enclosures shall be steel with back panels and a hinged door with handle and lock. Enclosure rating shall be NEMA 3R (3RX in corrosive areas).
- D. All internal components shall conform to the requirements of Section 16491 – Control Components and Devices.
- E. Panel layout shall provide a minimum 25% free area.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: All equipment shall be attached to walls and ceiling/floor assemblies and shall be mounted firmly in place. Detectors shall not be supported solely by suspended ceilings. Fasteners and supports shall be sized to support the required load.

**B. Conductors**

1. The requirement of this section apply to all system conductors, including all signaling line, initiating device, notification appliance, auxiliary function, remote signaling, AC and DC power and grounding/shield drain circuits, and any other wiring installed by the Contractor pursuant to the requirements of these Specifications.
2. All circuits shall be rated power limited in accordance with NEC Article 760.
3. All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.
4. All signaling line circuits, including all addressable initiating device circuits shall be 18 AWG minimum or as per manufacturer's requirements.
5. All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 14 AWG minimum or per manufacturer's requirements.
6. All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 7 strands shall be permitted for No. 16 and No. 18 conductors, and a maximum of 19 strands shall be permitted for No. 14 and larger conductors.
7. All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.
8. All visual notification appliance circuits shall be 14 AWG minimum XHHW or twisted pairs or twisted shielded pairs or per manufacturer's requirements.

**C. Conductors and Raceway**

1. Except as otherwise required by the NYC Building Code and/or these Specifications, the installation of all system circuits shall conform to the requirements of Article 760 and raceway installation to the applicable sections of Chapter 3 of NFPA 70, National Electrical Code.
2. The entire system shall be installed in a skillful manner in accordance with approved manufacturer's installation manuals, shop drawings and wiring diagrams. The Contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type required by the NEC and approved by local authorities having jurisdiction for the purpose.

3. Any shorts, opens, or grounds found on new or existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.
4. The Contractor shall neatly tie-wrap all field-wiring conductors in the gutter spaces of the control panels and secure the wiring away from all circuit boards and control equipment components. All field-wiring circuits shall be neatly and legibly labeled in the control panel. No wiring except home runs from life safety system circuits and system power supply circuits shall be permitted in the control panel enclosures. No wiring splices shall be permitted in a control panel enclosure.
5. All penetration of floor slabs and firewalls shall be fire stopped in accordance with all local fire codes.

**D. Conduit Raceway**

1. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.
2. The requirements of this section apply to all system conduits, raceways, electrical enclosures, junction boxes, pull boxes and device back boxes.
3. Provide conduits meeting the requirements of Section 16130 - Electrical Raceway Systems.
4. All system conduits, which are installed in areas, which may be subject to physical damage or weather, shall be rigid steel, 3/4 -inch minimum.
5. Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.
6. All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or by fire damage, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.
7. All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back boxes shall be readily accessible for inspection, testing, service and maintenance.
8. All junction and pull boxes in the fire alarm system shall be identified by having the covers painted Red.

### 3.02 FIELD QUALITY CONTROL

#### A. Test and Inspection

1. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.
2. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.
3. All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the Contractor.
4. The system including all its sequence of operations shall be demonstrated to the City of New York and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the City of New York and the fire inspector.
5. At the final test and inspection, a factory-trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.
6. All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72.
7. A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.

### 3.03 TRAINING

- #### A. Following completion of installation and field testing, provide training for 12 employees of the City at the transfer station in the proper operation, trouble-shooting and maintenance of the fire alarm and detection system equipment as described in Section 01821 - Training.
1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.



B. Requirements

1. The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.
2. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.
3. Instruction shall be made available to the New York City Fire Department if requested by the City.

-END OF SECTION-

**Section 13852**  
**RADIATION DETECTION SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The radiation detection system shall consist of fixed (permanently mounted) radiation detection assemblies, detection control unit, portable radiation detection unit, and all necessary appurtenances required for a complete installation.
- B. The radiation detection system will be used to monitor and detect the presence of radiation sources embedded in sanitation trucks entering the station.

**1.02 RELATED SECTIONS**

- A. Section 16055 – Electrical Requirements for Shop-Assembled Equipment

**1.03 SYSTEM DESCRIPTION**

- A. Design Requirements
  - 1. The fixed system shall detect shielded radioactive sources in moving sanitation vehicles traveling at 5 miles per hour or less.
  - 2. The fixed system shall be in accordance with Section 16055 - Electrical Requirements for Shop-Assembled Equipment.
- B. Performance Requirements
  - 1. Monitoring Frequency: Up to 320 trucks per day during two eight-hour shifts; up to 30 trucks per hour at peak delivery times.

**1.04 SUBMITTALS**

- A. Contractor shall submit working drawings, shop drawings, and material specifications in accordance with Section 01300 - Shop Drawings.
- B. Shop Drawings
  - 1. Product information for all equipment
    - a. Manufacturer's product name and model number
    - b. Manufacturer's standard catalog product data
    - c. Manufacturer's specification data
    - d. Description of construction features
    - e. Performance and operation data

- f. Installation and mounting details, instructions and recommendations
  - g. Service and calibration requirements
  - h. Dimensions
- 2. Arrangement and erection drawings of the equipment and controls
- 3. Schematic control diagrams
- 4. Electrical connection diagrams
- 5. Complete description of the control systems
- C. Provide Operation and Maintenance manuals in accordance with Section 01831 - Operation and Maintenance Manuals.

#### 1.05 QUALITY ASSURANCE

- A. The manufacturer shall have ISO 9001 certification or shall maintain a quality assurance program verified by a third party inspection agency.
- B. The fixed system shall either be UL listed or CE marked.
- C. The manufacturer shall have a minimum of three (3) years experience in the manufacturing of substantially similar systems.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle all products and materials as specified in Section 01651 - Transportation and Handling of Material and Equipment, and Section 01661 - Protection of Material and Equipment.
- B. Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting the requirements of the approved shop drawings.
- C. Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Protect from harm in accordance with the manufacturer's recommendations.

#### 1.07 PROJECT CONDITIONS

- A. Project Environmental Requirements: Design and construct the system for continuous operation under the following temperature and humidity conditions:

1. Control Rooms
  - a. Air conditioned and heated
  - b. Ambient Temperature: Normal range is 65 to 80 degrees F
  - c. Relative Humidity: Normal range is 40 to 60 percent
2. Outdoor locations
  - a. Ambient Temperature: -10 to 120 degrees F
  - b. Relative Humidity: 100 percent maximum
3. Where required, provide thermal enclosures equipped with thermostatically controlled space heaters.

#### 1.08 WARRANTY

- A. The Contractor shall furnish a manufacturer's warranty that all of its equipment will be free of defects caused by faulty material and/or workmanship and shall repair or replace those parts for a period of three (3) years after completion of final acceptance testing.

#### 1.09 MAINTENANCE

##### A. Spare Parts

1. Provide spare parts in accordance with Section 01750 - Spare Parts and Maintenance Materials.
2. Furnish and deliver spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification Section.
3. Pack spare parts in containers suitable for long-term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
4. The following shall constitute the minimum spare parts:
  - a. All standard recommended spare parts, as indicated in the equipment manufacturer's instructions manual for each component of the system.
  - b. Furnish the following complete spare units:
    - (1) One dozen of each type and size of fuse used
    - (2) One fixed detection assembly
    - (3) One detection control unit
    - (4) One pair vehicle presence sensors

- B. Maintenance Service: The manufacturer shall inspect, calibrate, check and report to the City of New York on the radiation detection system every six months during the warranty period. The inspection shall include all equipment provided, and shall include witnessing of in-service operation.

## PART 2 PRODUCTS

### 2.01 EQUIPMENT

#### A. Fixed Detection Units

##### 1. Detection Assemblies

- a. Quantity: Two
- b. Combined Detection Volume: Nominal 3000 cubic inches
- c. Combined Detection Area: At least 1440 square inches
- d. Detector Material: Premium plastic scintillator
- e. Radiation Detected
  - (1) Medium and high energy gamma emitters
  - (2) Neutrons
- f. Sensitivity: Detect a 5 percent increase over background radiation levels, assuming a 10  $\mu$ R/hr background.
- g. Detection Separation: As shown
- h. Detection Assembly Enclosure
  - (1) NEMA 4
  - (2) Stainless steel or nickel-plated steel with powder coat
  - (3) Aluminum access door
  - (4) Lockable 2- or 3-point latch
  - (5) Enclosure Size: Nominal 72-inches by 18-inches by 8-inches
  - (6) Mounting: I-beam mount as shown
- i. Shielding: 1/8-inch lead, within the enclosure
- j. Temperature Range: -31 to 122 degrees F.
- k. Humidity Range: 10 to 95 percent relative humidity

## 2. Detection Control Unit

- a. Wall mounted
- b. Front panel mounted items
  - (1) Ready light
  - (2) Scanning light
  - (3) Alarm light
  - (4) Alphanumeric display
  - (5) Keypad
  - (6) Horn
  - (7) Silence push button
  - (8) Power On/Off
- c. Background Radiation
  - (1) Measurement: Background radiation level is continuously monitored and updated until the vehicle activates the presence sensor.
  - (2) Compensation: Automatic compensation for the reduction of background radiation detection due to the presence of individual vehicles as they move between the detectors.
- d. Radiation Detection Interval: Calculate radiation level within 0.25 seconds of gross measurement.
- e. Speed Detection: Calculate vehicle speed from presence sensors.
- f. Alarms
  - (1) Radiation Detected. Based on statistical analysis, Sigma value
  - (2) High Speed. Vehicle exceeded speed limit.
- g. Diagnostics
  - (1) Reboot after power failure
  - (2) Continuous during power-up and normal operation
- h. Outputs
  - (1) RS-232 communication link, including as a minimum the following information:
    - (a) Radiation value
    - (b) Excessive speed alarm
    - (c) High radiation alarm

- (2) Separate relay outputs on alarms specified
  - i. Printer with the following information available
    - (1) Date and time of alarm
    - (2) Date and time of alarm acknowledge
    - (3) Background count rate
    - (4) Alarm set point
    - (5) High count rate for each detector
    - (6) Detector fault indication
  - j. Temperature Range: 40 to 95 degrees F
  - k. Telephone modem for remote diagnostics
  - l. Humidity Range: 10 to 75 percent relative humidity
  - m. Power: 120 Vac
3. Accessories
- a. Vehicle Presence Sensor
    - (1) Photo detectors (2 pairs)
    - (2) Detects the presence of a vehicle immediately adjacent to the detector
  - b. Cabling between detector units and control unit provided by system supplier.
  - c. Check Source: Minimum 8  $\mu\text{Ci}$   $^{137}\text{Cs}$ , license-free
  - d. Personal Computer with remote telephone servicing option
  - e. Alarm Assembly
    - (1) General: Provide a vertically-stacked visual and audible alarm assembly. The assembly shall provide operator notification of the following alarms:
      - (a) Speed limit exceeded
      - (b) Radiation level exceeded
    - (2) Size: Nominal 70 mm diameter

- (3) Enclosure Rating: NEMA 4X
- (4) Environment: Suitable for outdoor use
- (5) Temperature Limits: -10 to 130 degrees F
- (6) Power: 120 Vac
- (7) Mounting: Vertical, mounted on wall
- (8) Mounting Hardware: Corrosion-resistant
- (9) Visual alarms
  - (a) Lamp Type: LED
  - (b) Available Colors: Red, amber, blue, green, clear
  - (c) Quantity: 2
  - (d) Colors Provided: Red, amber
- (10) Audible alarms
  - (a) Quantity: 2
  - (b) Provide a distinct tone for each alarm.
  - (c) Volume: At least 100 dB max.
- (11) Alarm Assembly Manufacturers
  - (a) Allen-Bradley Series 855T
  - (b) Or approved equal

#### 4. Products

- a. Model ASM-3000E/II by Thermo Electron RMP
- b. Model RadSentry POV-GN by Canberra Industries
- c. Or approved equal

#### B. Portable Detection Unit

- 1. Unit used to perform survey of diverted sanitation truckload to:
  - a. Determine location of nuclide.
  - b. Determine type of nuclide.
- 2. Performs
  - a. Gamma spectrometry
  - b. Neutron detection



- c. Nuclide identification
  - d. Dose rate display
  - e. Accumulated dose display
  - f. Source finder
- 3. Consists of a LaBr scintillation detector, multi-channel analyzer, amplifier, high voltage power supply, and memory.
- 4. Display: Backlit LCD
- 5. Housing: Waterproof, dust tight
- 6. Temperature Range: 4 to 131 degrees F
- 7. Power: Batteries, rechargeable NiMH
- 8. Accessories
  - a. Personal computer-based software to allow qualitative and quantitative analysis
  - b. Battery charger
  - c. Holster
  - d. Carrying case
- 9. Products
  - a. Model identiFINDER by Thermo Electron RMP
  - b. Model InSpector 1000 by Canberra Industries
  - c. Or approved equal

## PART 3 EXECUTION

### 3.01 INSTALLATION

#### A. Interface with Other Work

- 1. The radiation detection system shall interface with the scale data management system provided by others (PIN 82704RR00033). The unit shall interface over an RS232 communication link, sending information on an event basis, with a carriage return at the end of the string. Other communication settings shall be coordinated during construction.

#### B. Sequence of Operation

- 1. Each sanitation truck will pass between the two detector assemblies. The detection control unit shall calculate the speed of the truck.

2. The detection control unit shall send the following information to the inbound scale driver interface unit for each vehicle:
  - a. Calculated radiation level
  - b. High speed alarm (if detected)
  - c. High radiation alarm (if detected)
3. The detection control unit shall also energize the alarm assembly if either of the two alarms specified above are activated.

### 3.02 FIELD QUALITY CONTROL

#### A. Field Testing

1. Provide field testing in accordance with Section 01811 - Preliminary and Final Field Tests.
2. The Contractor, under the supervision of the supplier, and other suppliers as applicable, shall perform the following system checkout and startup functions:
  - a. Check and approve the installation of all components and all cable and wiring connections between the various system components prior to placing the equipment into operation.
  - b. Conduct a complete system checkout and adjustment, including calibration, tuning, checking, and testing. When there are future operational functions included in this work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up.
  - c. The Contractor shall provide all test equipment necessary to perform the testing during system checkout and start-up.
  - d. The Contractor and supplier shall be responsible for initial operation of the system and shall make any required changes, adjustment or replacements for operation and equipment necessary to perform the functions intended.
  - e. The Contractor shall submit to the Resident Engineer certified calibration reports as soon as calibration is completed.
  - f. The Contractor shall submit to the Resident Engineer an installation inspection report certifying that all equipment has been installed correctly and is operating properly. Authorized representatives of both Contractor and the supplier shall sign the report.

**B. Manufacturer's Field Services**

1. The Contractor shall retain the services of the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by it the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation.
2. In addition to the start-up services described above, the supplier shall perform a yearly calibration and operational check for the duration of the warranty. The check shall be done by a factory-trained and certified technician. The check shall include system observation during normal working hours.
3. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
4. **Warranty Support**
  - a. Includes weekly system diagnostics from the manufacturer via the telephone modem for the warranty period at no additional cost.
  - b. The manufacturer shall have capability to have a remote terminal for accessing the radiation detection unit via telephone line.
  - c. The system shall include a modem, necessary cabling and telephone extension to support this telecommunications operation.
  - d. The manufacturer shall submit monthly reports to DSNY based on the results of the telephone diagnostics. The manufacturer shall notify DSNY immediately if any diagnostic test fails.

**3.03 CALIBRATION**

- A. Calibrate in the presence of the City of New York. Confirm that the equipment is functioning and calibrated prior to requesting City of New York to witness calibration.
- B. Calibrate using test equipment that is at least five times more accurate than instruments to be calibrated. Calibrate electronic test equipment within three months prior to testing and with accuracies traceable to NIST. Prepare calibrate reports for each device.
- C. Adjust secondary functions, such as alarm setpoints and output data, during initial calibration, and demonstrate after system is placed in service. Include this information on the calibration report.

3.04 TRAINING

- A. Provide training as specified in Section 01821 - Start-up and Training.
- B. Training shall consist of, at a minimum, an eight-hour course, comprising:
  - 1. Basic radiation concepts
  - 2. Operation and maintenance of the fixed system, including response to alarms
  - 3. Operation, use and maintenance of the portable unit, including surveying procedures and source identification

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 13861**  
**ODOR CONTROL SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. High-pressure, fogging-type, odor control system comprising the following:
1. Plunger pumps with motors
  2. Variable frequency drives
  3. Nozzles
  4. Piping, tubing, fittings, valves and appurtenances
  5. Stainless Steel bases
  6. Inlet water filters
  7. Control valves
  8. Chemical pumps
  9. Heat Tracing and Insulation
  10. System controls including all switches, gages and meters
  11. All other accessories required to produce complete working system

**1.02 RELATED SPECIFICATIONS**

- A. Related Work specified in other sections includes, but is not limited to, the following:
1. Division 1 - General Requirements
  2. Section 02505 - Leakage Tests
  3. Section 09912 - Interior Painting
  4. Section 15052 - Steel and Stainless Steel Pipe
  5. Section 15060 - Hangers and Supports
  6. Section 15071 - Vibration Control
  7. Section 15076 - Piping and Equipment Identification
  8. Section 15081 - Piping Insulation
  9. Section 15771 - Electric Heat Tracing Systems
  10. Division 16 - Electrical
  11. Section 17212 - Programmable Logic Controllers
  12. Section 17320 - Control Panels and Enclosures

**1.03 SUBMITTALS**

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Shop Drawings: Submit working drawings, including arrangement and erection drawings of the piping, equipment and control equipment; schematic control

diagrams; electrical connection diagrams; and complete description of the control system.

- C. Provide manufacturer's data showing pump performance, nozzle performance, motor horsepower, system pressures and other operational parameters.
- D. Operation and Maintenance: Submit operation and maintenance manuals for the odor control equipment.

#### 1.04 SYSTEM DESCRIPTION

- A. The odor control system manufacturer shall provide a package type system with all equipment and component parts completely mounted and assembled on the skid, piped and pre-wired requiring only external power for operation. The skid mounted system shall be used to remove volatile malodorous components characteristic of municipal solid waste. A diluted, water-based neutralizing agent, Anotec 0307 manufactured by A.T. Products Corp., will be sprayed through fog nozzles located within the ductwork on the discharge side of roof exhaust fans. Neutralizing agent will not spray over the processing floor. The piping and nozzle arrays in each transfer station will be located in an unheated area subject to freezing temperatures. Provide electric heat tracing in conformance to Section 15771 - Electric Heat Tracing Systems and insulation in conformance with Section 15081 - Piping Insulation, of the Plumbing Contract, to odor control system piping as shown on the Drawings. The odor control system discharges to multiple discharge points (exhaust ducts downstream of exhaust fans), as shown on the Drawings. Provide each discharge point with a control valve to safely put discharge points into or out of odor control service. Provide automatic draining of discharge point systems that are taken out of service to prevent dripping. Provide adjustable frequency drives to adjust pump discharge in response to manual selection of in-service discharge points and adjustable system pressure. Provide systems that can be totally drained, including the pump heads and all piping. Station exhaust fan designations, fan capacities and exhaust stack sizes are summarized as follows:

1.	F-EAF-1	38,350 SCFM	60" Dia.
2.	F-EAF-2	38,350 SCFM	60" Dia.
3.	F-EAF-3	30,350 SCFM	52" Dia.
4.	F-EAF-4	38,350 SCFM	60" Dia.
5.	F-EAF-5	30,350 SCFM	52" Dia.
6.	F-EAF-6	38,500 SCFM	60" Dia.
7.	F-EAF-7	19,500 SCFM	42" Dia.
8.	F-EAF-8	50,200 SCFM	68" Dia.
9.	F-EAF-14	16,000 SCFM	40" Dia.

## 1.05 QUALITY ASSURANCE

- A. The odor control system manufacturer shall have a minimum of three (3) years experience.

## 1.06 SPARE PARTS

- A. For each odor control system, provide the following spare parts:
  - 1. Fifty (50) nozzles
  - 2. Five Hundred (500) replacement polypropylene nozzle filters
  - 3. Thirty (30) replacement (one (1) micron filter cartridges for low pressure twin filter
  - 4. Four (4) 55-gallon drums of neutralizing agent Anotec 0307, manufactured by A.T. Products Corp., Waukesha, Wisconsin
  - 5. Two (2) motorized 120 VAC, 1PH 3-way drain valves
  - 6. Twelve (12) 21 oz. bottles of pump oil
  - 7. Two (2) pump rebuild kits

## 1.07 WARRANTY

- A. The Warranty shall be in conformance with Article 24 – Maintenance and Guaranty of the Standard Construction Contract.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. Johnson March, Inc
  - 2. Atomizing Systems, Inc.
  - 3. Fogco Systems, Inc.
  - 4. Or approved equal.

## 2.02 MATERIALS

- A. Provide nozzles capable of producing droplets mostly in the range of 5 to 20 microns at operating pressures of 500 to 1,200 psi. Each nozzle shall include a replaceable polypropylene filter element. Provide nozzles to produce enough fog to



effectively control odor generated by the handling of municipal solid waste at the transfer station and discharged at the exhaust fans, but as a minimum provide nozzles with a flow rate of 0.0285 gpm at 1,200 psi system pressure. Provide nozzles of type 316 stainless steel construction, with NPT tapered thread connections.

- B. For nozzle manifolds at the discharge points, provide 1/2-inch O.D. type 316 stainless steel tubing with welded nozzle fittings rated for pressures up to 3,000 psi. Provide ASME certified welds. Locate nozzle manifolds in the horizontal run of exhaust stacks, downstream of the exhaust fans. Seal around exhaust stack penetrations. Provide pipe supports in accordance with Section 15060 - Hangers and Supports. Provide and locate nozzles as required and shown to produce and disperse enough mist to effectively control odor, but as a minimum provide eight nozzles in exhaust stacks less than 50" diameter, ten nozzles in stacks 50" diameter and 12 nozzles in stacks greater than 50" diameter. Provide a minimum of two additional spare nozzle fittings at each nozzle manifold in stacks 58" diameter and smaller, four in stacks of 60" diameter and eight in stacks 68" diameter. Plug any initially unused, spare nozzle fittings to prevent leakage during operation. Provide valves that will allow the system to totally drain, without retaining water in the nozzle fittings.
- C. For system piping, provide 1/2-inch and 3/4-inch type 316 stainless steel tubing and compression fittings rated for pressures up to 3,000 psi. Piping shall be supported in accordance with the details shown on the Contract Drawings and as specified in Section 15060 - Hangers and Supports.
- D. For discharge point control valves, provide 1/2-inch NPT type 316 stainless steel, motorized ball valves rated at 3,000 psi, and suitable for 120 volt, 1Ph. operation. Provide 3-way ball valves to drain upon valve shutdown. Provide slow-acting ball valves with actuation time of five-seconds minimum. Ball valves shall have totally enclosed actuator gear train, factory lubricated. Motorized ball valves shall be Swagelok Whitey, or equal. Provide a manually-operated, 1/2-inch type 316 stainless steel two-way ball valve, rated at 3,000 psi, upstream of each motorized valve.
- E. Provide heavy-duty, direct drive, triplex plunger pumps with stainless steel wetted parts. Provide pumps to deliver enough water and chemical at sufficient pressure to the nozzles to effectively control odor generated by the handling of municipal solid waste at the transfer stations, but as a minimum provide pumps with a flow rate of 2.85 gpm at 1,200 psi system pressure. Size each pump to provide the entire system requirements. For each pump provide inlet solenoid valve to close on pump shut down, inlet water low-flow shut-off switch, stainless steel pulsation dampener, high temperature thermal water discharge valve, 2 1/2-inch diameter inlet and discharge oil-filled type pressure gauges, inlet and discharge isolation valves, discharge water pressure regulator, 4-20mA stainless steel pressure transducer rated at 2,000 psi minimum, pressure relief valve, dump solenoid valve to relieve system pressure on pump shutdown, discharge check valve and discharge flex rubber hose pressure

rated at 2,000 psi minimum. For each pump provide a drain valve with connection capable of fully draining the system, including the pump head. The pump motors shall be TEFC, minimum 5 HP and shall operate at 460-volt, 3-phase, 60-hertz.

F. Acceptable manufacturers for the plunger pumps are as follows:

1. General Pump
2. Cat Pumps Corporation
3. AR North America
4. Or approved equal

G. Provide an inlet water low-pressure shut-off switch and a discharge high-pressure shut-off function controlled by the PLC controller for the plunger pumps.

H. Provide industrial, multi-stage, polypropylene cartridge-type water filtration for the odor control systems to ensure 5-micron, minimum, filtration, inlet water pressure regulator, and appropriate flow to the pump units. Housings shall be stainless steel with replaceable cartridges. Provide inlet, outlet, air bleed and drain valves for the filtration unit. Components shall be mounted to skid and easily accessible. Provide a 2 1/2-inch diameter oil-filled type pressure gauge on the inlet and outlet to the filtration system.

I. Provide a low level switch specifically designed for monitoring level in a chemical drum. The switch shall be of the guided float type, with Type 304 stainless steel stem and float, and with a SPST contact. The switch assembly shall be provided with sufficient cable for connection to the odor control system control panel, to permit removal of the assembly for maintenance, and for drum replacement. The panel shall alarm when the level falls to the set point level, initially set at 10% full. The panel shall also send an alarm signal to SCADA for low level. The low level switch shall be a manufactured by Omega Model LVK-204, or approved equal.

J. Provide one, skid mounted, adjustable, water driven, proportioning-type chemical metering pump to deliver chemical into the plunger pump suction line at a consistent rate over varying water pressure and flow rates. Provide pumps made of chemical resistant materials able to operate at inlet water pressure of 85 psi. Pump shall have an induction range of 0.4% to 4% of water flow. Provide chemical pump with a chemical resistant flexible suction line and filter suitable for submerging into chemical. Acceptable manufacturers for the chemical pumps are as follows:

1. Dema Engineering Company
2. Dosmatic U.S.A., Inc.
3. Or approved equal

K. Mount the pumps, motors, control panel, filtration system and associated components for the odor control system on a stainless steel skid equipped with vibration mounts and suitable for bolting to a concrete pad. Vibration control equipment shall meet the requirements of Section 15071 – Vibration Control.

Situate skid components to allow easy access for maintenance. Provide stainless steel construction for the skid chassis including all brackets, supports, screws and other components. Size and install all structural components to comply with the requirements of the equipment being supported. All skid mounted equipment shall be pre-wired from the factory, requiring only external power provided by E contract.

- L. Provide one constant torque, adjustable frequency drive (AFD) for each pump in the odor control system to vary the speed of the corresponding plunger pump in response to system requirements. Normal operating pressure shall be as set at the pressure transducer when all discharge points are on-line. When discharge points are taken off-line, the AFD will decrease pump speed and output to maintain the normal operating pressure. Provide a set-point controller to adjust the system pressure. A minimum 4:1 turndown ratio shall be provided for the pump discharge flow. Provide AFD operation status indication including "Ready", "Power On", "Run" and "Fault" L.E.D. pilot lights.

M. Adjustable Frequency Drive Requirements

1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.
2. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.
3. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor's full nameplate rating.
4. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.
5. Provide adjustable frequency drives that utilize 6-pulse drive technology.
6. Operate at a minimum efficiency of 95 percent at rated load.
7. Operate from a 460-volt, 3-phase, 60-hertz supply with a voltage variation of plus or minus 10-percent and a frequency variation of plus or minus 2-hertz.
8. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.
9. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.

10. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.
11. Operate under the following ambient conditions:
  - a. Ambient Temperature: 0 to 40 degrees C
  - b. Humidity: 0 to 95 percent
12. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.
13. Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - a. Robicon
  - b. Cutler-Hammer
  - c. Toshiba
14. Input Disconnect: Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.
15. Input Reactor: Provide input reactor or isolation transformer, if required.
16. Converter Section: Provide input section that converts 460-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes.
17. Filter Sections: Provide dc link reactor and filter capacitors as required.
18. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain a constant volts per hertz ratio on the output with voltage boost for startup as required.
19. Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:
  - a. Start push button
  - b. Stop push button
  - c. "Local-Remote" control selection
  - d. Speed control settings
  - e. Speed meter with hertz and 0-100 percent scales
  - f. Diagnostics package with fault indication and reset push button

- N. Provide local control panel at the pumps in a stainless steel, NEMA 4 enclosure with AFD and all control devices required to provide a complete functioning system. The control devices shall include but not be limited to the following:
1. Disconnect switch
  2. Hand-Off-Auto (H-O-A) selector switch for each pump
  3. Programmable logic controller, micro type, meeting the applicable requirements of Section 17212, Programmable Logic Controllers, Ethernet capable
  4. Set-point controller (as discrete panel-mounted device)
  5. Local-Off-Remote selector switch for each valve
  6. Pump 1-Off-Pump 2 selector switch
  7. Off-Running indicating lights for each pump
  8. On-Drain-Auto selector switch for each valve
  9. On-Drain indicating lights for each valve
  10. Pressure set point and drain time periods shall be adjustable from the panel front
- O. All indicator lights shall be of the push-to-test LED indicating lamp type.
- P. From the H-O-A selector switch, "Off" mode shuts system off. In "Auto" mode, the AFD controls pump speed in response to pressure set-point controller. In "Hand" mode, pump runs and allows operator to manually start pump and adjust speed. The Pump 1-Off-Pump 2 selector switch allows selection of the duty pump. Provide labeled OFF-RUNNING status lights for each pump.
- Q. Each discharge point control ball valve shall be controlled by a three-position selector switch, located on the control panel. "Off" mode prohibits valve operation. In "Local" mode, the valve shall be operated by "On" and "Drain" push buttons mounted on the control panel. In "Auto" mode, interlock each motorized ball valve with its related discharge point exhaust fan motor to allow ball valve to be "on" (open) only if fan motor is running. In "Auto" mode, when the fan stops, the valve shall move to the "Drain" position. Provide nameplate indicating appropriate exhaust fan number discharge point below each selector switch.

- R. Provide dry contact closures, rated 5A at 120VAC, for remote monitoring of the following:
1. Pump Run (for each pump)
  2. Pump Fail (for each pump)
  3. System Fault (Comprised of the following)
    - a. Inlet Water Low Flow
    - b. Inlet Water Low Pressure
    - c. Discharge High Pressure
  4. Low Odor Chemical Level
  5. All of the above alarms including each condition that causes a system fault shall be separately displayed on the system control panel.
- S. Provide all electrical and control components to meet the requirements of Division 16 of the Electrical Contract.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install odor control equipment in accordance with the manufacturer's recommendations and approved shop drawings, and as specified in Division 1. Coordinate odor control equipment design and installation with the exhaust ducts.
- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on the proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1.
- C. Tests: After installation of the odor control equipment, controls and all appurtenances, subject the units to a field running test, as specified in Division 1, under actual operating conditions.
- D. Additional Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to inspect the completed installation, under actual operating conditions, after the system has been in operation for 60-days. Make any necessary adjustments.

#### 3.02 CLEANING AND PAINTING

- A. Paint odor control equipment as specified in Section 09912 – Interior Painting. Do not paint stainless steel components.

### 3.03 TRAINING

- A. Provide training in accordance with Section 01821 – Start-up and Training.
- B. The manufacturer of the Odor Control System shall include one day of on-site classroom and hands-on training at the station. The day is on session of 8 hours.
  - 1. Maintenance – (2 hours) of training shall be included. Training to include operation of the system and regular maintenance (electrical, pneumatic and mechanical). Additionally the City of New York key maintenance personnel shall be allowed to “shadow” the installation process whenever possible. By “shadowing” the equipment installation, the highest level of practical knowledge can be obtained.
  - 2. Supervisors – (2 hours) of training shall be included. Training shall include operation of the system and basic troubleshooting as a minimum.
  - 3. Operators Training – (4 hours) of on-site training shall be included. Operator training shall provide use skills along with safety training.

-END OF SECTION-

**Section 13915**  
**FIRE-SUPPRESSION PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Automatic wet-type, Class I standpipe systems.
- B. Wet-pipe sprinkler systems.
- C. Dry-pipe sprinkler systems.

**1.02 RELATED SPECIFICATIONS**

- A. Section 07842 - Fire Resistive Joint System
- B. Section 09912 - Interior Painting
- C. Section 10520 - Fire-Protection Specialties
- D. Section 13851 - Fire Alarm and Detection System
- E. Section 13921 - Electric-Drive, Centrifugal Fire Pumps
- F. Section 13953 - Foam/Water Fire Suppression System
- G. Section 15052 - Steel and Stainless Steel Pipe
- H. Section 15060 - Hangers and Supports
- I. Section 15076 - Piping and Equipment ID
- J. Section 15081 - Piping Insulation
- K. Section 15110 - Plumbing Valves
- L. Section 15430 - Plumbing Specialties

**1.03 REFERENCES**

- A. Codes and NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
  - 1. NFPA 11, "Low-, Medium-, and High -Expansion Foam"
  - 2. NFPA 13, "Installation of Sprinkler Systems"
  - 3. NFPA 14, "Installation of Standpipe, Private Hydrant, and Hose Systems"
  - 4. NFPA 16, "Installation of Foam-Water Sprinkler and Foam- Water Spray System"
  - 5. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances"
  - 6. Welding Material - ASME Code and procedure



7. Valves - Bear UL/FM Label or Marking
8. BSA Approvals - City of New York Building Code.
9. MEA Numbers - New York City Building Code.
10. Earthquake/Seismic - International Building Code 2003 Section 1621, and ASCE 7-02 Section 9.6
11. NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection System"
12. UL, "Underwriters Laboratory"
13. NFPA 54, "National Fuel Gas Code"
14. NFPA 70, "National Electrical Code"
15. NFPA 72, "National Fire Alarm Code"
16. City of New York Building Code

#### 1.04 SYSTEM DESCRIPTIONS

- A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 inch hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.
- B. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water which is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included.
- C. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig. Testing Pressure: Listed for at least 300 psig.

- B. Fire-suppression standpipe system design shall be approved by authorities having jurisdiction.
1. Minimum residual pressure at each hose-connection outlet is the following:
    - a. NPS 2-1/2 Hose Connections: 65 psig
- C. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.
1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers
  2. Sprinkler Occupancy Hazard Classifications
    - a. Transfer Station Areas: High Pile Storage
    - b. Storage Areas: Ordinary Hazard, Group I
    - c. Mechanical Equipment Rooms: Ordinary Hazard, Group I
    - d. Office and Locker Room Areas: Light Hazard
  3. Maximum Protection Area per Sprinkler
    - a. Office Spaces: 225 sq. ft.
    - b. Storage Areas: 130 sq. ft.
    - c. Transfer Station Areas 130 sq. ft.
    - d. Mechanical Equipment Rooms: 130 sq. ft.
    - e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated
  4. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 and NYC Fire Department requirements, unless otherwise indicated:
    - a. Light-Hazard Occupancies: 250 gpm for 30 minutes
    - b. Ordinary-Hazard Occupancies: 500 gpm per for 60 to 90 minutes
    - c. Extra Hazard Occupancies: 500 gpm for 90-120 minutes
- D. Seismic Requirements: All piping shall be provided with seismic restraints in accordance with the seismic provisions of the International Building Code (IBC) 2003, Section 1621 and ASCE 7-20, Section 9.6, in conjunction with the current City of New York Building Code to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural notes on the Structural Contract Drawings and Specifications for site and structure specific seismic design criteria.

## 1.06 SUBMITTALS

## A. Product Data: For the following:

1. Piping materials, including dielectric, flexible connections, and sprinkler specialty fittings
2. Pipe hangers and supports, and seismic restraints
3. Valves, listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim
4. Air compressors and electrical data
5. Sprinklers, escutcheons, and guards. Sprinkler flow characteristics, mounting, finish, and other pertinent data
6. Hose connections, size, type, and finish
7. Hose stations, size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack
8. Fire department connections and roof manifolds, type, number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish
9. Alarm flow and supervisory devices, and electrical data

## B. Shop Drawings: Power wiring, signal, and control wiring diagrams

1. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
2. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic style number.

## C. Fire-hydrant flow test report

## D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, New York City Building Code and that have been approved by authorities having jurisdiction, including hydraulic calculations signed by New York State Professional Engineer, if applicable.

- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13, NFPA 14 and New York City Building Code Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- F. Welding certificates
- G. Field quality-control test reports
- H. Operation and Maintenance Data: For standpipe and sprinkler specialties to include in emergency, operation, and maintenance manuals.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
  - 1. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified Professional Engineer licensed in the State of New York.
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- C. Permits: Contractor shall obtain and pay for all required permits, fees, inspections and approvals by authorities having jurisdiction.
- D. The installer shall be a City of New York licensed approved contractor.
- E. The installer shall be licensed to install fire alarm fire suppression equipment in the City of New York and in New York State.
- F. Except as modified herein, conform to the required and advisory provisions of the Building Code of the City of New York and NFPA 13 for design, equipment materials, installation, workmanship, examination, inspection, and testing. Include all materials, accessories, and equipment inside and outside the building for each system to be complete and ready for use. Design and provide each system to accommodate blind spaces, beams, beam pockets, concealed spares, piping, electrical equipment, ductwork, and other construction and equipment in accordance with detailed drawings submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers. Provide devices and equipment for fire protection service of a make or type which is UL listed or FM approved for use in sprinkler and standpipe systems. Where applicable whenever the Building Code of the City of New York references the NFPA publications, the ad-

visory provisions are considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears.

- G. The Contractor shall provide complete, new sprinkler fire protection water service connection from the backflow preventer assembly provided under the plumbing work, wet pipe alarm valve, electric alarm bell, fire department siamese connection, sprinkler head, flow switches, piping hangers, test connections and all appurtenances. It shall be understood that the final design of the wet and dry pipe sprinkler fire protection systems, including, but not limited to, the agreement, hydraulic calculations, size and location of risers, feed mains, cross mains, test connections, branch lines and drains, and the locations, spacing, number and types of heads or nozzles shall be the responsibility of the Contractor and shall conform with the requirements of the Building Code of the City of New York, the local Authorities, Standards and Codes listed in these specifications. The Contractor shall be responsible for procuring approval from the Fire Department and Building Department.
- H. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

#### 1.08 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including, but not limited to, light fixtures, ductwork, HVAC equipment, large openings, catwalks, platforms, and partition assemblies.

#### 1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Provide number of sprinklers required by NFPA 13 and sprinkler wrench. Provide separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

### PART 2 PRODUCTS

#### 2.01 DUCTILE-IRON PIPE AND FITTINGS

- A. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell end and plain end.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile iron, standard pattern AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern
  2. Gaskets: AWWA C111, rubber
- B. Grooved-End, Ductile-Iron Pipe: AWWA C151, with factory- or field-formed, radius-cut-grooved ends according to AWWA C606
1. Grooved-Joint Piping Systems
    - a. Manufacturer: Victaulic Co. of America or approved equal
    - b. Grooved-End Fittings: UL-Listed or FM approved, ASTM A 536, ductile-iron casting or ASTM A 48, cast-iron with OD matching ductile-iron-pipe OD.
    - c. Grooved-End-Pipe Couplings: UL-Listed AWWA C606, gasketed fitting matching ductile-iron-pipe OD. Include ductile-iron housing with keys matching ductile-iron-pipe and fitting grooves, pressure responsive synthetic rubber gasket of a FlushSeal® design with center leg, or approved equal, and steel bolts and nuts. Victaulic Style 31 or approved equal.
    - d. Grooved-End-Pipe Transition Coupling: UL-Listed or FM approved and AWWA C606, gasketed fitting with end matching ductile-iron-pipe OD and end matching steel-pipe OD. Include ductile-iron housing with key matching ductile-iron-pipe groove and key matching steel-pipe groove, pressure responsive synthetic rubber gasket listed for use with housing, and steel bolts and nuts. Victaulic Style 307 or approved equal.
    - e. Grooved-End Transition Flange: UL-Listed or FM approved, Class 125 gasketed fitting with key for ductile-iron-pipe dimensions. Include flange-type, ductile-iron housing with synthetic rubber gasket listed for use with housing and steel bolts and nuts. Victaulic Style 341 or approved equal.

## 2.02 STEEL PIPE AND FITTINGS

- A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53, Scheduled 40 with factory- or field-formed threaded ends. Provide Schedule 40 hot-dip galvanized for dry system.
1. Cast-Iron Threaded Flanges: ASME B16.1
  2. Malleable-Iron Threaded Fittings: ASME B16.3

3. Gray-Iron Threaded Fittings: ASME B16.4
  - a. Hot-dip galvanized fittings for dry system.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized. Include ends matching joining method.

**B. Grooved-Joint Piping Systems**

1. Grooved-End, Standard-Weight, Sch 40, Steel Pipe: ASTM A 53, hot-dip galvanized and with factory- or field-formed, square-cut, grooved ends.
2. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Central Sprinkler Corp.
  - b. Ductilic, Inc.
  - c. JDH Pacific, Inc.
  - d. National Fittings, Inc.
  - e. Shurjoint Piping Products, Inc.
  - f. Southwestern Pipe, Inc.
  - g. Star Pipe Products; Star Fittings Div.
  - h. Victaulic Co. of America
  - i. Ward Manufacturing
3. Grooved-End Fittings: UL-listed or FM approved, ASTM A 536, ductile-iron casting; ASTM A 234 forged steel; or ASTM A 53 fabricated from carbon steel pipe with OD matching steel-pipe OD. Hot-dip galvanized for dry system.
4. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA 13, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, pressure responsive synthetic rubber gasket listed for use with housing, and steel bolts and nuts. (Tongue and recess rigid type couplings shall not be permitted.)
  - a. Rigid Type: Housing shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13.
    - (1) 1-1/4 inch to 4 inch: "Installation Ready" stab-on design for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. Victaulic FireLock Style 009H or approved equal.

- (2) 5 inch and Larger: Standard rigid couplings. Victaulic FireLock Style 005 or Style 07 or approved equal.
- b. Flexible Type: Use in seismic areas where required by NFPA 13.
  - (1) 2 inch to 8 inch: "Installation Ready" stab-on design for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. Victaulic Style 177 QuickVic™ or approved equal.
  - (2) 5 inch and Larger: Standard flexible couplings. Victaulic Fire-Lock Style 75 or Style 77 or approved equal.
- 5. Grooved-End, Steel Pipe Flange Adapters: ASTM A536 ductile iron casting, flat faced, designed for incorporating flanged components with ANSI Class 125 and 150 bolt-hole patterns to a grooved piping system. Victaulic Style 741 or 744 or approved equal.

## 2.03 DIELECTRIC FITTINGS

- A. Dielectric Unions: Factory-fabricated assembly, designed for 175-psig minimum working pressure at 180 deg F. Provide insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company
    - c. Epco Sales, Inc.
    - d. Hart Industries International, Inc.
    - e. Watts Industries, Inc.; Water Products Div.
    - f. Zurn Industries, Inc.; Wilkins Div.
- B. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company
    - c. Epco Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.



- C. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.
1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Advance Products and Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company
    - d. Pipeline Seal and Insulator, Inc.
- D. Dielectric Couplings: Galvanized steel with inert and non-corrosive thermoplastic lining and threaded ends and 175-psig minimum working-pressure rating at 225 deg F.
1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
- E. Dielectric Nipples: Electroplated steel or ductile iron with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 175-psig working-pressure rating at 230 deg F.
1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Perfection Corporation
    - b. Precision Plumbing Products, Inc.
    - c. Victaulic Co. of America

## 2.04 FLEXIBLE CONNECTORS

- A. Flexible connectors shall have materials suitable for system fluid. Include 175-psig minimum working-pressure rating and ends according to the following:
1. NPS 2 and Smaller: Threaded
  2. NPS 2-1/2 and Larger: Flanged
  3. Option for NPS 2-1/2 and Larger: Grooved for use with grooved-end-pipe couplings

- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent fire protection products may be submitted for approval.

1. Anvil International
2. Anamet Inc.
3. Flex-Hose Co., Inc.
4. Flexicraft Industries
5. Flex-Pression, Ltd.
6. Flex-Weld, Inc.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. Unaflex Inc.

- C. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Provide copper-tube ends or bronze flanged ends, braze welded to hose.

- D. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Provide steel nipples or flanges, welded to hose.

- E. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Provide stainless-steel nipples or flanges, welded to hose.

## 2.05 CORROSION-PROTECTIVE ENCASEMENT FOR PIPING

- A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube or sheet.

## 2.06 SPRINKLER SPECIALTY FITTINGS

- A. Sprinkler specialty fittings shall be UL listed or FM approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping. Sprinkler specialty fittings shall have 250-psi minimum working-pressure rating if fittings are components of high-pressure piping system.

- B. Outlet Specialty Fittings

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Central Sprinkler Corp.
  - b. Ductilic, Inc.
  - c. National Fittings, Inc.
  - d. Shurjoint Piping Products, Inc.
  - e. Star Pipe Products; Star Fittings Div.

- f. Victaulic Co. of America
  - g. Ward Manufacturing
- 2. Mechanical-T and Cross Fittings: UL 213, ductile-iron housing with synthetic rubber gaskets, bolts and nuts, and threaded or grooved outlets.
- 3. Snap-On and Strapless Outlet Fittings: UL 213, ductile-iron housing or casting with gasket and threaded outlet.
- C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or grooved inlet and outlet, test valve, and orifice and sight glass.
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Central Sprinkler Corp.
    - b. Fire-End and Croker Corp.
    - c. Viking Corp.
    - d. Victaulic Co. of America.
- D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Elkhart Brass Mfg. Co., Inc.
    - b. Fire-End and Croker Corp.
    - c. Potter-Roemer; Fire-Protection Div.
    - d. Victaulic Co. of America.
- E. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. AGF Manufacturing Co.
    - b. Central Sprinkler Corp.
    - c. G/J Innovations, Inc.
    - d. Triple R Specialty of Ajax, Inc.
    - e. Victaulic Co. of America.

F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. CECA, LLC
- b. Merit Brass.

G. Dry-Pipe System Fittings: UL-Listed or FM approved listed for dry-pipe service

## 2.07 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FM approved, with 175-psig minimum working pressure rating.

B. Provide valves of same type from same manufacturer.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.

- 1. NPS 1-1/2 and Smaller: Bronze or brass body with threaded or grooved ends
- 2. NPS 2 and NPS 2-1/2: Bronze or brass body with threaded ends or ductile-iron or brass body with grooved ends
- 3. NPS 3: Ductile-iron body with grooved ends
- 4. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. NIBCO
- b. Victaulic Co. of America
- c. Kennedy Valve Div.
- d. Milwaukee Valve Co.

D. Butterfly Valves: UL Listed or FM approved

- 1. NPS 2 and Smaller: Bronze body with threaded ends.
  - a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - (1) NIBCO
    - (2) Global Safety Products, Inc.
    - (3) Milwaukee Valve Company.
    - (4) Victaulic Co. of America
    - (5) McWane, Inc.; Kennedy Valve Div.

2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.
  - a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - (1) NIBCO
    - (2) Central Sprinkler Corp.
    - (3) Global Safety Products, Inc.
    - (4) McWane, Inc.; Kennedy Valve Div.
    - (5) Mueller Company
    - (6) Pratt, Henry Company
    - (7) Victaulic Co. of America
- E. Check Valves NPS 2 and Larger: UL Listed or FM approved, swing type, cast-iron body with flanged or grooved ends.
  1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Central Sprinkler Corp.
    - b. Crane Co.; Crane Valve Group; Crane Valves
    - c. Crane Co.; Crane Valve Group; Jenkins Valves
    - d. Firematic Sprinkler Devices, Inc.
    - e. Globe Fire Sprinkler Corporation
    - f. Grinnell Fire Protection
    - g. Hammond Valve
    - h. McWane, Inc.; Kennedy Valve Div.
    - i. Mueller Company
    - j. NIBCO
    - k. Potter-Roemer; Fire Protection Div.
    - l. Reliable Automatic Sprinkler Co., Inc.
    - m. Star Sprinkler Inc.
    - n. Stockham
    - o. Victaulic Co. of America
    - p. Watts Industries, Inc.; Water Products Div.
    - q. Milwaukee Valve Company
- F. Gate Valves: UL Listed or FM approved, OS&Y type
  1. NPS 2 and Smaller: Bronze body with threaded ends
    - a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
      - (1) Crane Co.; Crane Valve Group; Crane Valves
      - (2) Hammond Valve

- (3) NIBCO
- (4) United Brass Works, Inc.
- (5) Victaulic Co. of America
- (6) Milwaukee Valve Company

2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends

- a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- (1) Clow Valve Co.
- (2) Crane Co.; Crane Valve Group; Crane Valves
- (3) Crane Co.; Crane Valve Group; Jenkins Valves
- (4) Hammond Valve
- (5) Milwaukee Valve Company
- (6) Mueller Company
- (7) NIBCO
- (8) Red-White Valve Corp.
- (9) United Brass Works, Inc.
- (10) Victaulic Co. of America

G. Indicating Valves: UL Listed or FM approved, with integral indicating device and ends matching connecting piping.

- 1. Indicator: Electrical, 115-V ac, pre-wired, single-circuit, supervisory switch
- 2. NPS 2 and Smaller: Ball or butterfly valve with bronze body and threaded ends

- a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- (1) Milwaukee Valve Company
- (2) NIBCO
- (3) Victaulic Co. of America

3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends

- a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- (1) Central Sprinkler Corp.
- (2) Grinnell Fire Protection
- (3) McWane, Inc.; Kennedy Valve Div.
- (4) Milwaukee Valve Company

- (5) NIBCO
- (6) Victaulic Co. of America

H. Pressure Reducing Valve (PRV): UL Listed or FM approved.

- 1. Globe or angle pattern.
- 2. Grooved or flanged ends.
- 3. Ductile iron or bronze body with epoxy coating
- 4. Provided with restriction tube fitting, pressure reducing control and flow clean strainer
- 5. Pressure gauge upstream and downstream of the PRV
  - a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval
    - (1) CLA-VAL Valves
    - (2) Viking
    - (3) Control Valves

2.08 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2 and Smaller

- 1. MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.
- 2. Meets the intent of MSS SP-110, 2-piece forged brass body with chrome plated brass ball and stem, 175-psig maximum CWP rating, blow-out proof stem, and Pressfit® ends or approved equal.

B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

## 2.09 SPECIALTY VALVES

## A. Sprinkler System Control Valves: UL listed or FM approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating.

## 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. Victaulic Co. of America
- b. Central Sprinkler Corp.
- c. Firematic Sprinkler Devices, Inc.
- d. Globe Fire Sprinkler Corporation
- e. Grinnell Fire Protection
- f. Reliable Automatic Sprinkler Co., Inc.
- g. Star Sprinkler Inc.
- h. Viking Corp.

## 2. Alarm Check Valves: UL Listed or FM approved, minimum 175-psig working pressure, designed for horizontal or vertical installation, with bronze or brass grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, retarding chamber and fill-line attachment with strainer. Internal components shall be replaceable without removal from installed position.

- a. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

## 3. Dry-Pipe Valves: UL Listed or FM approved, minimum 175-psig working pressure, differential type; with bronze or brass seat with O-ring seals, single-hinge pin, and latch design. Include UL Listed, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment. Air pressure to water pressure ratio is approximately 1 to 6. The valve shall be externally resettable and all internal components shall be replaceable without removal from installed position.

- a. Air-Pressure Maintenance Device: UL Listed, automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig minimum inlet pressure.

## (1) Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- (a) TYCO
- (b) Victaulic Co. of America



- (c) Central Sprinkler Corp.
- (d) General Air Products, Inc.
- (e) Globe Fire Sprinkler Corporation
- (f) Grinnell Fire Protection
- (g) Reliable Automatic Sprinkler Co., Inc.
- (h) Star Sprinkler Inc.
- (i) Viking Corp.

- b. Air Compressor: F-AIC-01, UL Listed, fractional horsepower, 460-V ac, 60 Hz, three phase

- (1) Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- (a) TYCO
    - (b) Gast Manufacturing, Inc.
    - (c) Grinnell Fire Protection
    - (d) Reliable Automatic Sprinkler Co., Inc.
    - (e) Viking Corp.
    - (f) General Air Products

- B. Automatic Drain Valves: UL Listed, NPS, ball-check device with threaded ends.

- 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. TYCO
    - b. Guardian Fire Equipment
    - c. Croker

## 2.10 SPRINKLERS

- A. Sprinklers shall be UL listed or FM approved, with 175-psig minimum pressure rating. Sprinklers shall have 250-psig minimum pressure rating if sprinklers are components of high-pressure piping system. Sprinklers shall be glass-bulb type. Body shall be die cast brass, with hex-shaped wrench boss cast into the body to facilitate installation and reduce the risk of damage during installation.
- B. Sprinklers under an uninsulated roof shall be on intermediate temperature classification.
- C. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. AFAC Inc.
  - 2. Central Sprinkler Corp.
  - 3. Firematic Sprinkler Devices, Inc.
  - 4. Globe Fire Sprinkler Corporation.

5. Grinnell Fire Protection
  6. Reliable Automatic Sprinkler Co., Inc.
  7. Star Sprinkler Inc.
  8. Victaulic Co. of America
  9. Viking Corp.
  10. TYCO
- D. Automatic Sprinklers: With heat-responsive element complying with the following:
1. UL Listed for nonresidential applications
  2. UL Listed for early-suppression, fast-response applications
- E. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
1. Open Sprinklers: UL Listed, without heat-responsive element
    - a. Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8
    - b. Orifice: 17/32 inch, with discharge coefficient K between 7.4 and 8.2
- F. Sprinkler types, features, and options as follows:
1. Pendent sprinklers
  2. Recessed sprinklers, including escutcheon
  3. Sidewall sprinklers
  4. Sidewall, dry-type sprinklers
  5. Upright sprinklers
- G. Sprinkler Finishes for Upright, Pendent, Recessed, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
- H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers. Escutcheons shall be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer.
1. Ceiling Mounting: Chrome-plated steel, one piece, flat 1-inch vertical adjustment
  2. Sidewall Mounting: Chrome-plated steel, one piece, flat
- I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Guards shall be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer.

- J. Extra Heads: Provide wall-mounted cabinet, housing minimum of six extra sprinkler heads and sprinkler wrench. Extra sprinkler heads shall include two of all types used.
- K. Stainless Steel Sprinkler Fitting System: In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic AquaFlex® stainless steel sprinkler fittings system, or approved equal, may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided or unbraided (corrugated) type 304 stainless steel flexible tube with union joints factory pressure tested to 400 psi (2760 kPa). The flexible drop shall attach to the ceiling grid using a one-piece open gate bracket. The AquaFlex® system, or approved equal, shall be UL 2443 listed or FM approved.

## 2.11 HOSE STATIONS AND AUXILIARY HOSE STATIONS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. AFAC Inc.
  - 2. Potter-Roemer; Fire-Protection Div.
  - 3. American Fire Hose Cabinet Co.
  - 4. Angus Fire, Inc.
  - 5. Elkhart Brass Mfg. Co., Inc.
  - 6. Fire-End and Croker Corp.
  - 7. Or approved equal.
- B. Description: UL Listed or FM approved, hose rack assembly stations. Include brass rack nipple, hose rack, and the following:
  - 1. Angle Valve: 2½" UL listed, rough brass, 300-psig minimum pressure rating, 90-degree-angle-pattern hose valve with female NPS inlet and outlet, 2½" Model 4075, Potter Roemer or approved equal
  - 2. Hose Rack: 2½" Red polyester coated steel hose rack, Model 2887, Potter Roemer or approved equal
  - 3. Hose Rack Nipple: 2½" Satin brass, Model 2756, Potter Roemer or approved equal
  - 4. Pin Lug Coupling: 2½" Satin brass, Model 2939, Potter Roemer or approved equal
  - 5. Hose: 125 Feet, 2½" UL listed or FM approved, lined 500 lb. Polyflex hose, Model 2916, Potter Roemer or approved equal
  - 6. Nozzle: 2½" Polyester coated straight stream nozzle, Model 2948, Potter Roemer or approved equal

7. Escutcheon: 2½" Model 4722, Potter Roemer or approved equal
  8. Drain Valves: UL Listed
  9. Mountings: Pipe clamp or wall bracket for freestanding units
- C. Description: UL listed or FM approved, hose cabinet/rack assembly stations. Include brass rack nipple, hose rack, recessed metal cabinet, and the following:
1. Angle Valve: 2½" UL listed, rough brass, 175-psig minimum pressure rating, 90-degree-angle-pattern hose valve with female NPS inlet and outlet, 2½" Model 4075, Potter Roemer or approved equal
  2. Hose Rack: 2½" Red polyester coated steel hose rack, Model 2887, Potter Roemer or approved equal
  3. Hose Rack Nipple: 2½" Satin brass, Model 2756, Potter Roemer or approved equal
  4. Pin Lug Coupling: 2½" Satin brass, Model 2939, Potter Roemer or approved equal
  5. Hose: 125 Feet, 2½" UL listed or FM approved lined 500 lb. Polyflex hose, Model 2916, Potter Roemer or approved equal
  6. Nozzle: 2½" Polyester coated straight stream nozzle, Model 2948, Potter Roemer or approved equal
  7. Escutcheon: 2½" Model 4722, Potter Roemer or approved equal
  8. Drain Valves: UL Listed
  9. Hose Cabinet: 2 Hours Fire Rated Stainless Steel cabinet shall be 20 gauge white glossy polyester coated steel box, 20 gauge tubular steel door with 18 gauge with continuous steel hinge, brass pin, door and frame finished with prime polyester coating, wall mounted, recessed type, full wire glass, Model 1300 Croker, Potter Roemer or approved equal.
- D. Valve Cabinet: 2 Hours fire rated, 304 Stainless steel door and frame, for 2½" fire valve, recessed type, full wire glass, UL approved, continuous steel hinge, Model 1700, Croker or approved equal.
- E. The complete fire hose racks and cabinets installation shall be in accordance with New York City Building Code.

## 2.12 FIRE DEPARTMENT CONNECTIONS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
1. Central Sprinkler Corp.
  2. Elkhart Brass Mfg. Co., Inc.
  3. Fire-End and Croker Corp.
  4. Fire Protection Products, Inc.
  5. Guardian Fire Equipment Incorporated
  6. Potter-Roemer; Fire-Protection Div.
  7. Reliable Automatic Sprinkler Co., Inc.
- B. Exposed, Freestanding-Type, Fire Department Connection: UL listed or FM approved, 175-psig minimum working pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and New York fire department threads, and bottom outlet with pipe threads. Provide brass lugged caps, gaskets, brass chains, brass lugged swivel connection and drop clapper for each hose-connection inlet; 24-inch- high, brass sleeve; and round, floor, brass escutcheon plate with marking "AUTO SPRINKLER & STANDPIPE."
1. Finish including Fire Department Connection and Sleeve: Polished brass.
  2. Model 5763-B, Potter Roemer or approved equal. Fire department connection shall be in accordance with New York City Building Code.
- C. Where applicable, install a 90-degree elbow with drain connection at each Fire Department Connection. Elbow shall be equal to Victaulic #10-DR or approved equal.

## 2.13 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Flow Indicator: UL Listed or FM approved, electrical-supervision, paddle-operated-type, water-flow detector with minimum 175-psig working pressure rating and designed for horizontal or vertical installation. Provide two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-Vac and 0.25 A, 24-Vdc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- C. Alarm check valve incorporating integral flow alarm switch and Series 752 retard-  
ing chamber are acceptable for flow detection provided its switch characteristics meet those stated for the vane-type switch specified above. The alarm valve shall be UL listed and FM approved. The alarm valve shall be equipped with a removable cover assembly and shall be suitable for installation in the vertical position. The alarm valve shall be equipped with gauge connections on the system side and supply side of the valve clapper. The piping shall be externally galvanized. Minimum

working pressure 175 psig. Valve internal parts shall be replaceable without removing the valve from the installed position. Victaulic FireLock Series 751 or approved equal.

- D. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

1. ADT Security Services, Inc.
2. Grinnell Fire Protection
3. ITT McDonnell & Miller
4. Potter Electric Signal Company
5. System Sensor
6. Viking Corp.
7. Watts Industries, Inc.; Water Products Div.
8. Victaulic Co. of America

- E. Pressure Switch: UL listed or FM approved, electrical-supervision-type, water-flow switch with retard feature. Provide single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

- a. Grinnell Fire Protection
- b. Potter Electric Signal Company
- c. System Sensor
- d. Viking Corp.

- F. Valve Supervisory Switch: UL listed or FM approved, electrical, single-pole, double-throw switch with normally closed contact and signals controlled valve is in other than fully open position.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

- a. McWane, Inc.; Kennedy Valve Div.
- b. Potter Electric Signal Company
- c. System Sensor

- G. Indicator-Post Supervisory Switch: UL listed or FM approved, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

- a. Potter Electric Signal Company
- b. System Sensor

## 2.14 PRESSURE GAUGES

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

1. AGF Manufacturing Co.
2. AMETEK, Inc.; U.S. Gauge
3. Brecco Corporation
4. Dresser Equipment Group; Instrument Div.
5. WIKA Instrument Corporation

- B. Description: UL listed or FM approved, 3-1/2-inch- minimum diameter, dial pressure gauge with range of 0 to 250 psig minimum.

1. Water System Piping: Provide caption "WATER" or "AIR/WATER" on dial face.
2. Air System Piping: Provide retard feature and caption "AIR" or "AIR/WATER" on dial face.

## 2.15 ALARM BELL

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval

1. System Sensor
2. Grainger
3. Potter

- B. Description: UL Listed or FM approved, approved for indoor and outdoor use, 10-inch diameter. Operating voltage 120 VAC.

1. Weatherproof back box, when installed outdoors.
2. Bells shall be suitable for surface mounting.
3. Bells shall be located as determined by the authority having jurisdiction.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. See Contract Drawings for fire-hydrant flow test,

**3.02 EARTHWORK**

- A. Refer to Section 02316 - Excavation and Section 02317 - Backfilling for excavating, trenching, and backfilling.

**3.03 EXAMINATION**

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.04 PIPING APPLICATIONS-GENERAL**

- A. Do not use welded joints for galvanized steel pipe.
- B. Flanges, flanged fittings, grooved joints couplings unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating shall be used in aboveground applications, unless otherwise indicated.
- C. Coordinate with piping shown in general specifications.

**3.05 STANDPIPE SYSTEM PIPING APPLICATIONS**

- A. Standard-Pressure, Wet-Type Standpipe System, 175-psig Minimum Working Pressure:
  - 1. NPS 4 and Smaller: Grooved-end, black, standard-weight, sch 40, steel pipe with square-cut, grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
  - 2. NPS 5 and NPS 6: Grooved-end, standard-weight, sch 40, steel pipe with square-cut, grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.



### 3.06 SPRINKLER SYSTEM PIPING APPLICATIONS

- A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig Minimum Working Pressure:
1. NPS 1-1/2 and Smaller: Threaded-end, black, standard-weight, sch 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
  2. NPS 2: Grooved-end, black, standard-weight steel pipe, sch 40, grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
  3. NPS 4 to NPS 8: Grooved-end, black, standard-weight. Sch 40, steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. Standard-Pressure, Dry-Pipe Sprinkler System, 175-psig Minimum Working Pressure:
1. NPS 1-1/2 and Smaller: Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
  2. NPS 2: Grooved-end, galvanized, standard-weight, sch 40, steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
  3. NPS 4 to NPS 8: Grooved-end, galvanized, standard-weight, sch 40, steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

### 3.07 VALVE APPLICATIONS

- A. Where specific valve types are not indicated, the following requirements apply:
1. Listed Fire-Protection Valves: UL listed or FM approved for applications where required by NFPA 13 and NFPA 14.
    - a. Shutoff Duty: Use ball, butterfly, or gate valves.
  2. Unlisted General-Duty Valves: For applications where UL-listed or FM-approved valves are not required by NFPA 13 and NFPA 14.
    - a. Shutoff Duty: Use ball, butterfly, or gate valves.
    - b. Throttling Duty: Use ball or globe valves.

### 3.08 JOINT CONSTRUCTION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping joint construction.
- B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 with wall thickness less than Schedule 40 unless

approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

- C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.
  - 1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings of the same manufacturer.
  - 2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings of the same manufacturer, unless otherwise indicated.
  - 3. All couplings must be installed in accordance with referenced standards. Follow manufacturer's instructions in all cases for all approvals and warranty enforcement.
  - 4. Dry-Pipe Systems: Use fittings and gaskets listed for dry-pipe service.
- D. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.
  - 1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.
  - 2. NPS 2-1/2 to NPS 4: Use dielectric flanges.
  - 3. NPS 5 and Larger: Use dielectric flange insulation kits.
- E. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

### 3.09 WATER SUPPLY CONNECTION

- A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Section 15140 - Domestic Water Piping for interior piping.
- B. Install shutoff valve, reduced pressure zone backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water distribution piping. Refer to Section 15430 - Plumbing Specialties for backflow preventers.

- C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water supply.

### 3.10 PIPING INSTALLATION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Engineer before deviating from approved working plans.
- C. Install underground ductile-iron service-entrance piping according to NFPA 24 and with restrained joints. Encase piping in corrosion-protective encasement.
- D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- F. Install grooved joint coupling flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler zone control valves, test assemblies, and drain piping.
- J. Install drain valves on standpipes.
- K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- L. Install alarm devices in piping systems.
- M. Hangers and Supports: Comply with NFPA 13 and Specification Section 15060 for hanger materials.
  - 1. Install standpipe system piping according to NFPA 14.
  - 2. Install sprinkler system piping according to NFPA 13.

3. Victaulic Style 009H, 005, and 07 rigid coupling, or approved equal, may be used with IPS steel piping systems, which meet the support and hanging requirements of NFPA 13. An adequate number of Victaulic Style 177, 75 and 77 flexible couplings, or approved equal, shall also be used to compensate for thermal expansion/ contraction of the pipe.
  4. All hangers and supports shall be UL listed or FM approved, stainless steel and double nutted.
- N. Seismic Requirements: All piping shall be provided with seismic restraints in accordance with the seismic provisions of the International Building Code (IBC) 2003, Section 1621 and ASCE 7-02, Section 9.6, in conjunction with the current City of New York Building Code to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural notes on the Structural Contract Drawings and Specifications for site and structure specific seismic design criteria.
1. In Victaulic grooved piping systems, seismic motion shall be accommodated by installing swing joints consisting of flexible couplings, pipe nipples and elbows that provide simultaneous movement in all directions, or other seismic movement compensation devices such as loops, offsets, or Style 155 expansion joints (when an in-line device is required), to provide flexibility to the system and help reduce pipe stresses. Refer to Victaulic design submittal #26.12.
  2. All fire pipe passing through or crossing building seismic joints, shall contain a flexible expansion loop, designed for seismic movement. Flexible loops shall impart no thrust loads to building structure. Loops shall be located at, or near, the building seismic joint. Seismic bracing shall not pass through building seismic joint and shall not connect or tie together different sides or parts of building structure,. Flexible loops shall be capable of movement in the  $\pm X$ ,  $\pm Y$ ,  $\pm Z$  planes. Movement requirements and location, relative to seismic separation, shall be determined by structural. Flexible loops may be installed to accommodate thermal expansion, seismic movement, and building settlement. Unless specified otherwise by system design engineer or governing codes, all flexible loop connections to fire piping shall be installed, inspected, and tested.
- O. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gauges to permit removal, and install where they will not be subject to freezing.
- P. Drain wet and dry-pipe sprinkler piping.

- Q. Pressurize and check dry-pipe sprinkler system piping, air-pressure maintenance devices and air compressors.
- R. Fill wet-standpipe system piping with water.
- S. Fill dry-pipe sprinkler system piping with compressed air.
- T. Install flexible connectors on fire-pump and pressure-maintenance-pump supply and discharge connections and in fire-suppression piping.
- U. Pipe Expansion Provisions: Connect, support and guide piping to permit and control pipe expansion and construction and to accommodate building expansion, contraction and settling without damage.
  - 1. Providing piping expansion loops or expansion joints sized to accommodate possible expansion without exceeding allowable pipe and fittings stresses in straight sections of water piping more than 150 feet in length. Locate expansion devices midway between anchor points, and the pipes guided as recommended.
  - 2. Provide anchors for piping within a structure consisting of welded plates, angles, channels, or beams braced and securely fastened to the pipe and to structural members adequate to safely withstand resulting stresses.
  - 3. Expansion and contraction of grooved piping systems shall be provided with loops or bends consisting of (8) couplings, (4) 90 degree elbows, and (3) grooved end pipe spools in accordance with manufacturer recommendations for expansion compensation.
- V. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gaskets style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for Contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Contractor shall remove and replace any improperly installed products

### 3.11 VALVE INSTALLATION

- A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim sets, controls, and specialties according to NFPA 13 and NFPA 14 and authorities having jurisdiction.

- B. Install listed fire-protection shutoff valves supervised-open, locate to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Valves for Wall-Type Fire Hydrants or Wall-Type Fire Hose Valves: Install non rising-stem gate valve in water-supply pipe.
- D. Install check valve in each water-supply connection. Install double check detector assembly instead of check valves in potable-water supply sources.
- E. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
  - 1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
  - 2. Install air compressor and compressed-air supply piping.

### 3.12 SPRINKLER APPLICATIONS

- A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:
  - 1. Rooms without Ceilings: Upright sprinklers.
  - 2. Rooms with Suspended Ceilings: Pendent sprinklers, Recessed sprinklers and Concealed sprinklers.
  - 3. Wall Mounting: Sidewall sprinklers.
  - 4. Spaces Subject to Freezing: Upright sprinklers, Sidewall dry sprinklers.
  - 5. Sprinklers listed for light hazard only shall be installed in office and Locker Room Areas.

### 3.13 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels and tiles.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

- C. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

### 3.14 HOSE-STATION INSTALLATION

- A. Install freestanding hose stations for access and minimum passage restriction.
- B. Install NPS 2-1/2 hose connections with NPS 2½ quick-disconnect and flow-restricting device, unless otherwise indicated.
- C. Install freestanding hose stations with support or bracket attached to standpipe or substrate.
- D. Install wall-mounting, rack-type hose stations. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Cabinets are specified in Section 10520 - Fire-Protection Specialties.

### 3.15 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install freestanding-type, fire department connections in level surface.
  - 1. Install protective pipe bollards on two sides of each fire department connection. Refer to Section 05500 - Metal Fabrications.
- B. Install ball drip valve at each check valve for fire department connection.

### 3.16 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect water-supply piping to fire-suppression piping. Include reduced pressure zone backflow preventer between potable-water piping and fire-suppression piping. Refer to Section 15430 - Plumbing Specialties for backflow preventers.
- D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.
- E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- F. Connect pressure pumps to the following piping and wiring:
  - 1. Sprinkler system, hydraulically
  - 2. Pressure gauges and controls, hydraulically
  - 3. Electrical power system

4. Alarm device accessories for pump
  5. Fire alarm
- G. Connect compressed-air supply to dry-pipe sprinkler piping.
- H. Connect air compressor to the following piping and wiring:
1. Pressure gauges and controls
  2. Electrical power system
  3. Fire alarm devices, including low-pressure alarm
- I. Electrical Connections: Power wiring is specified in Division 16.
- J. Connect alarm devices to fire alarm.
- K. Ground equipment according to Section 16060 – Grounding.
- L. Connect wiring according to Section 16121 - Wires and Cables – 600 Volts and Below.
- M. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.17 ROOF MANIFOLD

- A. Provide and install one or more roof manifolds where shown.
- B. All roof manifolds are 4 x 2-1/2 x 2-1/2 x 2-1/2 inches with cast brass body and three 2-1/2 inches cast brass angle hose valves. Three 2-1/2 inches cast brass cap with chain.

### 3.18 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Section 15076 - Piping and Equipment Identification.

### 3.19 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.



3. Energize circuits to electrical equipment and devices.
4. Start and run pressure pumps.
5. Start and run air compressors.
6. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
7. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
8. Coordinate with fire alarm tests. Operate as required.
9. Coordinate with fire-pump tests. Operate as required.
10. Verify that equipment hose threads are same as local fire department equipment.

- B. Report test results promptly and in writing to Commissioner and authorities having jurisdiction.

### 3.20 CLEANING AND PROTECTION

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.
- C. Protect sprinklers from damage until Substantial Completion.

### 3.21 DEMONSTRATION

- A. Engage a factory-authorized service representative to train DSNY's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Section 01781 - Project Closeout and Section 01821 - Training.

-END OF SECTION-

**Section 13921**  
**ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Full-service fire-pump controllers.
- B. Fire-pump accessories and specialties
- C. Pressure-maintenance pumps, controllers, accessories and specialties.
- D. Alarm panels.
- E. Flow meter systems.

**1.02 RELATED SPECIFICATIONS**

- A. Section 13851 - Fire Alarm and Detection Devices
- B. Section 13915 - Fire Suppression Piping
- C. Section 13953 - Foam/Water Fire Suppression System
- D. Section 15076 - Piping and Equipment ID
- E. Section 16060 - Grounding
- F. Section 16121 - Wires and Cables 600 Volts and Below

**1.03 REFERENCES**

- A. Codes and NFPA Standards: Fire pumps and accessories, Pressure-maintenance pumps and accessories, installation, and testing shall comply with the following.
  - 1. NFPA 20, "Installation of Stationary Pumps for Fire Protection"
  - 2. NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection System"
  - 3. NFPA 70, "National Electrical Code"
  - 4. NFPA 72, "National Fire Alarm Code"
  - 5. BSA Approvals - City of New York Building Code
  - 6. MEA Numbers - New York City Building Code
  - 7. Valves - Bear UL/FM label or marking
  - 8. City of New York Building Code

## 1.04 PERFORMANCE REQUIREMENTS

- A. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: 175-psig minimum working-pressure rating, unless otherwise indicated.

## 1.05 SUBMITTALS

- A. Product Data: For each type of product indicated, submit rated capacities, certified pump performance curves with each selection point indicated, operating characteristics, furnished accessories and specialties for each fire pump and pressure-maintenance pump.
- B. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, pressure-maintenance pumps, pressure-maintenance pump controllers, and pressure-maintenance pump accessories and specialties, submit. Include plans, elevations, sections, details, and attachments to other work.
  - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified registered professional engineer responsible for their preparation.
  - 2. Wiring Diagrams: Power, signal, and control wiring
- C. Manufacturer Seismic Qualification Certification: Submit certification that fire pumps and drivers and fire-pump controllers, pressure-maintenance pumps, accessories, and specialties will withstand seismic forces defined in Section 15071 - Vibration Controls. Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting, and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and submittal installation requirements
- D. Product Certificates: For each type of fire pump and fire-pump controller, signed by product manufacturer
- E. Source quality-control test reports
- F. Field quality-control test reports

- G. Operation and Maintenance Data: Submit data for fire pumps and drivers, pressure-maintenance pumps, controllers, accessories and specialties, to include in emergency, operation, and maintenance manuals.

#### 1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of fire pumps, pressure-maintenance pumps, and controllers and are based on specific systems indicated.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation.
- E. Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.
- F. Provide per New York City Building Code BSA approvals and MEA numbers.

#### 1.07 COORDINATION

- A. Coordinate size and location of concrete bases with the Contract Drawings.

### PART 2 PRODUCTS

#### 2.01 CENTRIFUGAL FIRE PUMP

- A. Description, General: UL listed and FM approved, factory-assembled and -tested, electric-drive, centrifugal fire pump capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 140 percent of total rated head.
  - 1. Provide fire pump to automatically maintain required pressure in supplied fire protection system in event City of New York water supply pressure is insufficient.
  - 2. Provide approved means of preventing cross-contamination of primary City of New York water supply.

3. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping
  4. Nameplate: Complete with capacities, characteristics, and other pertinent data
- B. Fabricate base and attachment to fire pump, pressure-maintenance pump and controllers with reinforcement to resist movement of pumps and controllers during a seismic event when their bases are anchored to building structure.
- C. Single-Stage, Horizontally Mounted, Split-Case Fire Pump:
1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. A-C Pump; ITT Industries
    - b. Reddy-Buffaloes
    - c. Fairbanks Morse
    - d. Peerless Pump
    - e. Armstrong Darling, Inc.
  2. Pump: Axially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
    - a. Impeller: Cast bronze construction to match fire pump, statically and dynamically balanced, and keyed to shaft
    - b. Wear Rings: Replaceable, bronze
    - c. Shaft and Sleeve: Steel shaft with bronze sleeve
      - (1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing
      - (2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland
  3. Coupling: Flexible and capable of absorbing torsional vibration and shaft mis-alignment. Include metal coupling guard.
  4. Driver: UL listed, NEMA MG 1, open-drip-proof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.

- a. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - (1) WEG Motors
  - (2) Lincoln Electric Company
  - (3) Marathon Electric, Inc.
- 5. Pump: Radially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
  - a. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft
  - b. Wear Rings: Replaceable, bronze
  - c. Shaft and Sleeve: Steel shaft with bronze sleeve
    - (1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing
    - (2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland

#### D. Fire-Pump Characteristics and Specialty Data

- 1. Fire-Pump: F-FP-01
  - a. Model: A-C Pump, ITT Industries Model 8 x 6 x 12  
F-M Series 8100 or approved equal
  - b. Rated Capacity: 1500 gpm
  - c. Total Rated Head: 150 psi
  - d. Outlet Flange Class: 125 lb.
- 2. Speed: Same as driver
- 3. Electric-Motor Driver: 200 hp, 1770 rpm, 480V, 3 phase, 60 Hz, F
- 4. Test Header Size
  - a. Hose Valves Required: Six
  - b. Hose Valve Size: NPS 2-1/2
- 5. Provide low point of pump casing with manual drain and high point with automatic air release valve.

6. Mount pump and drive motor on substantial steel or cast-iron baseplate with drip lip and drain connection.

## 2.02 FIRE-PUMP CONTROLLERS

- A. Fire-Pump Controllers, General: UL listed and FM approved and NFPA 20; listed for electric-drive, fire-pump service and service entrance; combined automatic and manual operation; factory assembled and wired; and factory tested for capacities and electrical characteristics. Soft Start/Soft Stop.
  1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Cutler-Hammer FT 90
    - b. Firetrol, Inc.
    - c. Joslyn Clark
  2. Rate controllers for 480 volt, 3 phase, 60 hertz operation and short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.
  3. Enclosure: UL 50, NEMA 12, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
  4. Controls, devices, alarms, functions, and operations listed in NFPA 20 and NFPA 72 as required for drivers and controller types used, and specific items listed.
  5. Isolating Switch and circuit breaker
    - a. Motor rated combination isolating disconnect switch/ circuit breaker, mechanically interlocked and operated with a single, externally mounted handle.
    - b. The isolating disconnect/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker.
    - c. The controller door shall have a locking type handle and a three-point cam and roller vault type hardware.

- d. Handle moved from:
    - (1) ON to OFF position: The interlocking mechanism shall sequence the circuit breaker OFF first, and then the isolating disconnect switch.
    - (2) OFF to ON position: The interlocking mechanism shall sequence the isolating disconnect switch ON first, and then the circuit breaker.
  - e. The circuit breaker trip curve adjustment shall be factory set, tested and sealed for load amps of the connected motor.
- 6. "Power on" pilot lamps, 1 per phase for each source.
  - 7. LED indicators shall indicate the following: Power On, Pump Running, Alarm, Deluge Open, Phase Failure, Interlock On, Emergency Isolation Switch Open, Low System Pressure, Transfer Switch Normal, Transfer Switch Emergency and Phase Reversal.
  - 8. Fire-alarm system connections for indicating motor running condition, loss-of-line power, and line-power phase reversal.
  - 9. The digital display shall indicate text messages for the status and alarm conditions of following: Motor On, Minimum Run Time/ Off Delay Time, Fail to Start, Under Voltage, Locked Rotor Trip, Over Frequency, Motor Over 320, Motor Overload, Printer Error, Pressure Error, Sequential Start Time, Local Start, Remote Start, System Battery Low, Over Voltage, Low Suction Pressure, Emergency Start, Drive Not Installed, Disk Error and Disk Near Full. The Sequential Start Timer and Minimum Run Timer/ Off delay Timer shall be displayed as numeric values reflecting the value of the remaining time.
  - 10. Automatic and manual operation and minimum run-time relay to prevent short cycling.
  - 11. The fire pump controller operator interface shall be capable of displaying true RMS digital motor voltage and current measurements for all three phases simultaneously.
  - 12. Water-pressure-actuated switch with independent high and low calibrated adjustments responsive to water pressure in fire-suppression piping.
  - 13. Automatic and manual shutdown.
  - 14. System pressure recorder, electric ac driven with spring backup.



## 15. Solid State Pressure Transducer.

- a. The controller shall be supplied with a solid state pressure transducer with a range of 0-300psi.
- b. Solid state pressure switch shall be used for both display of the system pressure and control of the fire pump controller.
- c. Systems using analog pressure devices or mercury switches for operational control will not be accepted.
- d. The pressure transducer shall be directly pipe mounted to a bulkhead pipe coupling without any other supporting members.
- e. The pressure transducer shall be mounted inside the controller to prevent accidental damage.

## 16. Event Recording

- a. Memory – The controller shall record all operational and alarm events (up to 3000 events) to system memory. All events shall be time and date stamped and includes an index number. The user shall have the ability to scroll through the stores messages in groups of 1, 10 or 100. The controller shall include a floppy disk drive to save all operational and alarm events.
- b. Communications – The controller shall feature two independent communications ports to allow connectivity to computers, modems, or building management systems.

## 17. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.

## 18. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with non-ferrous metal sensing piping, NPS 1/2, with globe valves for testing controller mechanism from system to pump controller. Include bronze check valve with 3/32-inch orifice in clapper or ground-face union with noncorrosive diaphragm having 3/32-inch orifice.

## B. Full-Service Fire-Pump Controllers

1. Type Starting: Soft-start with direct across the line connection for running pump.
2. Mounting: Floor standing cabin type for field electrical connections.

- C. Fire Pump Controller Power Transfer Switch, General: UL1008/FM and NFPA 20; factory assembled wired and tested as a single unit with the fire pump controller. The transfer switch shall be a Cutler Hammer FT-90, or approved equal, for normal utility power and second utility emergency power.

1. Enclosure: NEMA 12, attached directly to the fire pump controller.
2. Electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism on the switch.

## 2.03 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Provide the following:

1. Automatic air-release valve
2. Casing relief valve
3. Suction and discharge pressure gauges
4. Eccentric-tapered reducer at suction inlet
5. Concentric-tapered reducer at discharge outlet
6. Test-Header Manifold: Ferrous body for hose valves. Manufacturer's standard finish. Include bronze or cast-iron, exposed-type valve header with nozzle outlets; and round, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
7. Hose Valves: UL Listed, straightway pattern, and bronze with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards and finish same as for test-header-manifold escutcheon plate.
8. Ball Drip Valve: UL Listed
9. Isolating OS&Y gate valve or indicating butterfly valve
10. Discharge gate valve
11. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.
12. Main relief valve.
13. Flow meter

## 2.04 PRESSURE-MAINTENANCE PUMP

- A. Pressure-Maintenance Pump, General: Factory-assembled and -tested pumps with electric-motor driver, controller, accessories, specialties, cast-iron or stainless-steel casing, bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 125 dimensions unless Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.
1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
  2. Nameplate: Complete with capacity, characteristics, and other pertinent data.
  3. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. A-C Pump; ITT Industries (ITT Goulds)
    - b. MTH, Inc.
    - c. Grundfos Pumps Corp.
    - d. Sterling Peerless Pump; Sterling Fluid Systems Group
    - e. Peerless Pumps
  4. Driver: NEMA MG 1, open drip-proof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
- B. Controllers: UL listed and FM approved, NEMA 12, factory-assembled, -wired, and -tested, across-the-line type for combined automatic and manual operation.
1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Cutler-Hammer
    - b. Firetrol, Inc.
    - c. Joslyn Clark
  2. Enclosure: UL 508 and NEMA 250, Type 2, wall-mounting type for field electrical wiring.
    - a. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.

3. Rate controller for scheduled horsepower and include the following:

- a. Fusible disconnect switch
- b. Pressure switch
- c. Hand-off-auto selector switch
- d. Pilot light
- e. Running period timer

C. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:

1. Casing relief valve
2. Suction and discharge pressure gauges

2.05 PRESSURE-MAINTENANCE PUMP CHARACTERISTICS AND SPECIALTY DATA: F-JKP-01.

- A. Rated Capacity: 10 gpm
- B. Total Rated Head: 170 psi
- C. Pump Speed: 3450 rpm
- D. Electric-Motor Driver Size: 3 hp, 480v, 3 phase, 60 Hz

2.06 PRESSURE GAUGES

- A. Description: UL listed or FM approved, 3-1/2- to 4-1/2-inch- diameter dial with range of 0- to 250-psig minimum. Include caption "WATER" on dial face.
- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  1. AGF Manufacturing Co.
  2. AMETEK, Inc.; U.S. Gauge
  3. Brecco Corporation
  4. Dresser Equipment Group; Instruments Div.
  5. Marsh Bellofram
  6. WIKA Instrument Corporation

2.07 GROUT

- A. Description: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  1. Properties: Nonstaining, noncorrosive, and nongaseous
  2. Design Mix: 5000-psi, 28-day compressive strength

**2.08 SOURCE QUALITY CONTROL**

- A. Test and inspect fire pumps with their controllers according to NFPA 20 for certified shop tests.
- B. Verification of Performance: Rate fire pumps according to requirements indicated.

**2.09 BUILDING-AUTOMATION SYSTEM INTERFACE**

- A. Provide auxiliary contacts in pump controllers for interface to building SCADA system. Include the following:
  - 1. Low pressure for jockey pump
  - 2. Fire Pump Running
  - 3. Fire Pump Controller Loss of Phase
  - 4. Fire Pump Controller Phase Reversal
  - 5. Fire Pump Controller Connected to Alternate Source
  - 6. Fire Pump Controller Emergency Power Isolating Switch Open
  - 7. ATS-2 Power Source Emergency Power
  - 8. Fire Pump System Low Pressure
  - 9. Fire Pump System Trouble Alarm (grouped alarm, activated by any other fire pump alarm not previously listed)
  - 10. For 120V Alarm Bells (located inside and outside the Fire Pump Room)

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine areas, concrete bases, and conditions, with installer present, for compliance with requirements and other conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

- A. Install and align fire pump, pressure-maintenance pump, and controller according to NFPA 20.
- B. Install pumps and controllers to provide access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Set base-mounting-type pumps on concrete bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
  - 1. Support pump baseplate on rectangular metal blocks and shims or on metal wedges having small taper, at points near anchor bolts, to provide 3/4- to 1-1/2-inch gap between pump base and concrete base for grouting.
  - 2. Adjust metal supports or wedges until pump and driver shafts are level. Verify that coupling faces and pump suction and discharge flanges are level and plumb.
- D. Install suction and discharge piping equal to or greater than diameter of fire-pump nozzles.
- E. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.
- F. Install pressure gauges on fire-pump suction and discharge at pressure-gauge tapings.
- G. Support pumps and piping separately so weight of piping does not rest on pumps.
- H. Install piping accessories, hangers and supports, anchors, valves, meters and gauges, and equipment supports.
- I. Seismic Requirements: All piping shall be provided with seismic restraints in accordance with the seismic provisions of the International Building Code (IBC) 2003, Section 1621 and ASCE 7-02, Section 9.6, in conjunction with the current New York City Building Code to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural notes on the Structural Contract Drawings and Specifications for site and structure specific seismic design criteria.
- J. Install flow meters and sensors where indicated. Install flowmeter-system components and make connections according to manufacturer's written instructions.

- K. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical installer.

### 3.03 ALIGNMENT

- A. Align split-case fire-pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align vertically mounted, split-case pump and driver shafts after complete unit has been made plumb on concrete base, grout has set, and anchor bolts have been tightened.

### 3.04 CONNECTIONS

- A. Piping installation requirements are specified in Section 13915 - Fire-Suppression Piping. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect water supply and discharge piping to fire pumps with flexible connectors. Connect water supply and discharge piping to pressure-maintenance pumps with flexible connectors. Refer to Section 13915 - Fire-Suppression Piping for flexible connectors.
- D. Connect relief-valve discharge to point of disposal.
- E. Connect controllers to pumps.
- F. Connect fire-pump controllers to building fire-alarm system. Refer to Section 13851 - Fire Alarm and Detection System.
- G. Ground equipment according to Section 16060 - Grounding.
- H. Connect wiring according to Section 16121 - Wires and Cables – 600 Volts and Below.

## 3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform field tests for each fire pump when installation is complete. Comply with operating instructions and procedures in NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.
- C. Perform the following field tests inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Final Checks before Startup: Perform the following preventive-maintenance operations and checks:
    - a. Lubricate oil-lubrication-type bearings.
    - b. Remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
    - c. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.
    - d. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.
  - 3. Starting procedure for pumps is as follows:
    - a. Prime pump by opening suction valve and closing drains, and prepare pump for operation.
    - b. Open sealing-liquid supply valves if pump is so fitted.
    - c. Start motor.
    - d. Open discharge valve slowly.
    - e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland



immediately, but let packing run in before reducing leakage through stuffing boxes.

- f. Check general mechanical operation of pump and motor.
- 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- 5. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of the City of New York.

### 3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train DSNY maintenance personnel to adjust, operate, and maintain fire pumps, drivers, controllers, and pressure-maintenance pumps. Refer to Section 01781 - Project Closeout and Section 01821 - Training.

-END OF SECTION-

**Section 13953**  
**FOAM/WATER FIRE-SUPPRESSION SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Deluge foam/ water system and valve accessories
- B. Foam concentrate
- C. Concentrate controllers and concentrate control valve
- D. Bladder tank assemblies
- E. Foam concentrate piping and system overhead piping
- F. Discharge devices
- G. Deluge valve and release system

**1.02 RELATED SPECIFICATIONS**

- A. Section 07582 - Fire Resistive Joint System
- B. Section 09912 - Interior Painting
- C. Section 13851 - Fire Alarm and Detection System
- D. Section 13915 - Fire-Suppression Piping
- E. Section 13921 - Electric-Drive, Centrifugal Fire Pumps
- F. Section 15050 - Basic Mechanical Materials
- G. Section 15052 - Steel and Stainless Steel Pipe
- H. Section 15060 - Hangers and Supports
- I. Section 15076 - Piping and Equipment ID
- J. Section 15081 - Piping Insulation
- K. Section 15110 - Plumbing Valves
- L. Section 15430 - Plumbing Specialties

**1.03 REFERENCES**

- A. NFPA 11, "Standard for Low-, Medium-, and High-Expansion Foam"
- B. NFPA 13, "Installation of Sprinkler Systems"
- C. NFPA 16, "Installation of Foam-Water Sprinkler and Foam-Water Spray Systems"
- D. NFPA 30A, "Code for Motor Fuel Dispensing Facilities and Repair Garages"
- E. NFPA 54, "National Fuel Gas Code"
- F. Welding Material - ASME Code and procedure
- G. Valves - Bear UL/FM Label or Marking
- H. BSA Approvals - City of New York Building Code

- I. MEA Numbers - City of New York Building Code
- J. Earthquake/Seismic - International Building Code 2003 Section 1621, and ASCE 7-02 Section 9.6
- K. NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection System"
- L. UL, "Underwriters Laboratory"
- M. NFPA 70, "National Electrical Code"
- N. NFPA 72, "National Fire Alarm Code"
- O. City of New York Building Code

#### 1.04 SYSTEM DESCRIPTIONS

- A. Sprinkler system shall be an overhead deluge AFFF foam sprinkler system. System shall be designed to provide adequately proportioned foam water solution at listed water flows past proportioning device. System shall be installed in accordance with NFPA 16, NFPA 11 and NFPA 13.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Standard piping System Component Working Pressure: Listed for at least 175 psig, unless otherwise indicated.
- B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction
  - 1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.
  - 2. Sprinkler Occupancy Hazard Classifications
    - a. Transfer Station Areas: Ordinary Hazard, Group I
  - 3. Maximum Protection Area per Sprinkler
    - a. Transfer Station Areas: 100 sq. ft
    - b. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.

#### 4. Sprinkler Fire Classification

##### a. Diesel Fuel Dispensing Areas: Class B Fire

- C. Seismic Requirements: All piping shall be provided with seismic restraints in accordance with the seismic provisions of the International Building Code (IBC) 2003, Section 1621 and ASCE 7-20, Section 9.6, in conjunction with the current New York City Construction Codes to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural notes on the Contract Drawings and Specifications for site and structure specific seismic design criteria.

#### 1.06 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Shop Drawings: Submit working drawings, including arrangement and erection drawings of the piping, tanks, equipment and control equipment; schematic control diagrams; electrical connection diagrams; and complete description of the control system.
- C. Provide manufacturer's data showing capacity of the tanks, pump performance, nozzle performance, system pressures and other operational parameters.
- D. Provide Operation and Maintenance (O&M) manuals in accordance with Section 01831- Operations and Maintenance Manuals.

In addition to these, conform to specific instructions given below

- E. Product Data: For the following:
1. Piping materials, including dielectric, flexible connections, and sprinkler specialty fittings
  2. Pipe hangers and supports, and seismic restraints
  3. Valves, listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim
  4. Sprinklers, escutcheons, and guards. Sprinkler flow characteristics, mounting, finish, and other pertinent data
  5. Alarm devices and electrical data

- F. Shop Drawings: Power wiring, signal, and control wiring diagrams
  - 1. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
  - 2. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic, or approved equal, style number.
- G. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA11, NFPA 13, NFPA 16, New York City Construction Codes and that have been approved by authorities having jurisdiction, including hydraulic calculations, signed by NYC Professional Engineer, if applicable.
- H. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13, NFPA 16 and New York City Construction Codes. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- I. Welding certificates
- J. Field quality-control test reports
- K. Operation and Maintenance Data: For foam/water sprinkler specialties to include in emergency, operation, and maintenance manuals.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Installer's responsibilities include designing, fabricating, and installing foam/water fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test, if applicable.
  - 1. Commissioner Responsibility: Preparation of working plans, calculations, and field test reports by a qualified Professional Engineer licensed in the State of New York.
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- C. Permits: Contractor shall obtain and pay for all required permits, fees, inspections and approvals by Authorities having jurisdiction.
- D. The installer shall be a City of New York licensed approved Contractor.

- E. The installer shall be licensed to install fire alarm fire suppression equipment in the City of New York and in New York State.
- F. Except as modified herein, conform to the required and advisory provisions of the Construction Codes of the City of New York, NFPA 11, NFPA 13 and NFPA 16 for design, equipment materials, installation, workmanship, examination, inspection, and testing. Include all materials, accessories, and equipment inside and outside the building for each system to be complete and ready for use. Design and provide each system to accommodate blind spaces, beams, beam pockets, concealed spaces, piping, electrical equipment, ductwork, and other construction and equipment in accordance with detailed drawings submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers. Provide devices and equipment for fire protection service of a make or type which is UL listed or FM approved for use in deluge foam sprinkler systems. Where applicable whenever the Construction Codes of the City of New York references, the NFPA publications, the advisory provisions are considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears.
- G. The Contractor shall provide complete, new deluge foam/water fire protection system, complete with UL listed or FM approved deluge valve, concentrate controller, foam bladder tank, concentrate control valve, foam concentrate, discharge devices, alarm pressure switch, system control valve, electric alarm bell, fire department Siamese connection, sprinkler heads, flow switches, piping hangers, test connections and all appurtenances. It shall be understood that the final design of the deluge foam/water fire protection system, including, but not limited to, the agreement, hydraulic calculations, size and location of risers, feed mains, cross mains, test connections, branch lines and drains, and the locations, spacing, number and types of heads or nozzles shall be the responsibility of the Contractor and shall conform with the requirements of the Construction Codes of the City of New York, the local Authorities, Standards and Codes listed in these specifications. The Contractor shall be responsible for procuring approval from the City Fire Department and Buildings Department.
- H. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

#### 1.08 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including, but not limited to, light fixtures, ductwork, HVAC equipment, catwalks, and partition assemblies.

## 1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Provide number of sprinklers required by NFPA 16 and sprinkler wrench. Provide separate cabinet with sprinklers and wrench for each type of sprinkler on Project.
  2. 3% AFFF Foam Concentrate: Stored in stainless steel, or high density cross-linked polyethylene, or reinforced fiberglass polyester with a vinyl resin internal layer coating tanks or containers which have been designed for such foam storage. The storage environment shall be within the UL-listed temperature range.

## PART 2 PRODUCTS

### 2.01 DELUGE VALVES AND RELEASE SYSTEM

- A. Deluge valve: UL listed or FM approved with ductile iron body and capable of installation in the vertical and horizontal position.
1. Externally resettable by hydraulic means.
  2. Minimum working pressure of 175 psi
  3. Valve trim shall be galvanized and compatible with the installation.
  4. Product
    - a. Viking Corp: Model F-1
    - b. Victaulic Co. of American
    - c. or approved equal
- B. Deluge Release System: Deluge valve shall utilize a listed and approved release system.
1. Method of Release: Manual release system
  2. Pull stations for manual activation shall be compatible with release control plan.

## 3. Product

- a. Viking Corp – Model B-1/Par 3 Release Control Panel
- b. Victaulic Co. of American
- c. or approved equal

## 2.02 BLADDER TANK ASSEMBLIES F-FBT-01

## A. Foam bladder tank shall be UL listed or FM listed and shall adhere to the requirements of NFPA11 and NFPA16

- 1. System shall utilize an ASME code pressure vessel listed for use with the foam concentrate and proportioning method utilized.
- 2. Vertical tank with vinyl based polymerr
- 3. Tank: SA-516-70 Carbon Steel
- 4. Minimum Working Pressure: 175 psi. Contractor shall provide required primary relief valve to protect the tank from over-pressurization.
- 5. Backflow Preventer Valve: Provide reduced pressure zone valve assembly, as specified in Section 15430 - Plumbing Specialties, for the foam system if required.
- 6. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Viking Corp
  - b. Chemguard

## 2.03 FOAM CONCENTRATE

- A. Shall be listed for protection of immiscible (hydrocarbon) flammable and combustible liquids. Shall be listed at 3 parts concentrate to 97 parts water and shall be listed for use with fresh, sea or brackish water supplies.
- B. Shall be a synthetic aqueous film forming foam (AFFF) concentration. Protein based concentrates are strictly prohibited.
- C. Concentrate shall be UL listed or FM approved.
- D. Product
  - 1. Chemguard Ultraguard CUG 3% AR-AFFF
  - 2. Ansul Corporation
  - 3. or approved equal



## 2.04 FOAM CONCENTRATE PIPING

- A. Shall be compatible with foam concentrate to be used. Foam provider shall be consulted for acceptable materials of construction.
- B. Shall be designed for the least equivalent feet of pipe run from bladder tank discharge outlet to proportioning device and water supply to bladder tank. Excessive use of elbows and tees shall be avoided.
- C. Shall be substantially secured and restrained against movement, thrust and vibration.
- D. Shall be protected from excessive heat and freezing temperatures.
- E. Shall be installed with a fitting such as a grooved coupling or union to be readily removed between proportioning assemblies and concentrate control valve.
- F. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Viking Corp.
  - 2. TYCO Corporation

## 2.05 CONCENTRATE CONTROLLER (PROPORTIONER) AND CONTROL VALVE

- A. Concentrate controller: UL listed or FM approved
  - 1. Shall be listed and approved with the foam concentrate to be proportioned and the foam bladder tank.
  - 2. Brass, wafer type device
  - 3. Shall be listed with a nominal orifice plate size for the foam concentrate to be proportioned.
  - 4. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Viking Corp.
    - b. TYCO Corporation
- B. Concentrate control valve: Deluge valves to be supplied by AFFF shall utilize a 90 degree pattern type manufactured with a corrosive resistant Halar coating.
  - 1. Working pressure of not less than 250 psi unless listed for higher pressure.

2. Valve trim shall be compatible and installed following the manufacturer's specifications.
3. Pressure operated relief valve shall be employed on the priming line to release prime pressure from the top of the deluge valve.
4. Product
  - a. Viking Corp. Model E or F
  - b. TYCO Corporation
  - c. or approved equal

## 2.06 DISCHARGE DEVICES

- A. Fire sprinklers used in foam/ water sprinkler system: UL listed or FM approved.
1. Sprinklers that have been specifically tested and found suitable for the discharge of low expansion synthetic foam/water solution shall be installed.
  2. Sprinklers shall be tested as foam/water solution discharge outlets for minimum listed densities or densities indicated by installation standards, which ever is more stringent.
  3. Fire sprinklers, foam concentrate, proportioning devices and riser components shall be of one manufacturer.
  4. Product
    - a. Viking Corp. SIN VK350, K8.0
    - b. TYCO Corporation
    - c. or approved equal

## 2.07 STEEL PIPE AND FITTINGS

- A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53 Schedule 40, hot-dip galvanized with factory- or field-formed threaded ends.
1. Cast-Iron Threaded Flanges: ASME B16.1.
  2. Malleable-Iron Threaded Fittings: ASME B16.3
  3. Gray-Iron Threaded Fittings: ASME B16.4
    - a. Hot dip galvanized fittings

4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized. Include ends matching joining method.

**B. Grooved-Joint Piping Systems**

1. Grooved-End, Standard-Weight, Steel Pipe: ASTM A 53, Sch 40, hot-dip galvanized and with factory- or field-formed, square-cut, grooved ends
2. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Viking Corp.
  - b. Central Sprinkler Corp.
  - c. Ductilic, Inc.
  - d. JDH Pacific, Inc.
  - e. National Fittings, Inc.
  - f. Shurjoint Piping Products, Inc.
  - g. Southwestern Pipe, Inc.
  - h. Star Pipe Products; Star Fittings Div.
  - i. Victaulic Co. of America
  - j. Ward Manufacturing
3. Grooved-End Fittings: UL-listed and FM Global-Approved, ASTM A 536, ductile-iron casting; ASTM A 234 forged steel; or ASTM A 53 fabricated from carbon steel pipe with OD matching steel-pipe OD.
4. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA 13, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, pressure responsive synthetic rubber gasket listed for use with housing, and steel bolts and nuts. (Tongue and recess rigid type couplings shall not be permitted.) Victaulic Style 005.
  - a. Rigid Type: Housing shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13.
    - (1) 1-1/4 inch to 4 inch: "Installation Ready" stab-on design for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. Victaulic FireLock® Style 009H.
    - (2) 5 inch and Larger: Standard rigid couplings. Victaulic FireLock® Style 005 or Style 07.

- b. Flexible Type: Use in seismic areas where required by NFPA 13.
  - (1) 2 inch to 8 inch: "Installation Ready" stab-on design for direct 'stab' installation onto grooved end pipe without prior field dis-assembly and no loose parts. Victaulic Style 177 QuickVic.
  - (2) 5 inch and Larger: Standard flexible couplings. Victaulic Fire-Lock Style 75 or Style 77.
- 5. Grooved-End, Steel Pipe Flange Adapters: ASTM A536 ductile iron casting, flat faced, designed for incorporating flanged components with ANSI Class 125 and 150 bolt-hole patterns to a grooved piping system. Victaulic Style 741 or 744.

## 2.08 DIELECTRIC FITTINGS

- A. Dielectric Unions: Factory-fabricated assembly, designed for 175-psig minimum working pressure at 180 deg F. Provide insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Viking Corp.
    - b. Capitol Manufacturing Co.
    - c. Central Plastics Company.
    - d. Epco Sales, Inc.
    - e. Hart Industries International, Inc.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
- B. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system
  - 1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
    - a. Viking Corp.
    - b. Capitol Manufacturing Co.
    - c. Central Plastics Company
    - d. Epco Sales, Inc.
    - e. Watts Industries, Inc.; Water Products Div.
- C. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. Viking Corp.
- b. Advance Products and Systems, Inc.
- c. Calpico, Inc.
- d. Central Plastics Company
- e. Pipeline Seal and Insulator, Inc.

- D. Dielectric Couplings: Galvanized steel with inert and non-corrosive thermoplastic lining and threaded ends and 175-psig working-pressure rating at 225 deg F.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. Viking Corp.
- b. Calpico, Inc.
- c. Lochinvar Corp.

- E. Dielectric Nipples: Electroplated steel or ductile iron with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 175-psig working-pressure rating at 230 deg F.

1. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- a. Perfection Corporation
- b. Precision Plumbing Products, Inc.
- c. Victaulic Co. of America

## 2.09 FLEXIBLE CONNECTORS

- A. Flexible connectors shall have materials suitable for system fluid. Include 175-psig minimum working-pressure rating and ends according to the following:

1. NPS 2 and Smaller: Threaded
2. NPS 2-1/2 and Larger: Flanged
3. Option for NPS 2-1/2 and Larger: Grooved for use with grooved-end-pipe couplings

- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Anvil
2. Flex-Hose Co., Inc.

3. Flexicraft Industries
  4. Flex-Pression, Ltd.
  5. Flex-Weld, Inc.
  6. Metraflex, Inc.
  7. Proco Products, Inc.
  8. Unaflex Inc.
- C. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Provide copper-tube ends or bronze flanged ends, braze welded to hose.
- D. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Provide steel nipples or flanges, welded to hose.
- E. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Provide stainless-steel nipples or flanges, welded to hose.

## 2.10 LISTED FIRE-PROTECTION VALVES

- A. Necessary listed fire-protection valves utilized in the foam/water sprinkler system shall be as specified in Section 13915 - Fire-Suppression Piping and Section 15110 - Plumbing Valves.
- B. Valves shall be UL listed or FM approved, with 175-psig minimum working pressure rating.
1. Ball valves
  2. Butterfly valves
  3. Check valves NPS2 and larger
  4. Gate valves
  5. Indicating valves-System control valve
- C. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
1. NIBCO
  2. Victaulic Co. of America
  3. Kennedy Valve Div.
  4. Milwaukee Valve Co.

## 2.11 UNLISTED GENERAL-DUTY VALVES

### A. Ball Valves NPS 2 and Smaller

1. MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends
2. Meets the intent of MSS SP-110, 2-piece forged brass body with chrome plated brass ball and stem, 175-psig maximum CWP rating, blow-out proof stem, and Pressfit® ends.

### B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

### C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

### D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

## 2.12 ALARM DEVICES

### A. Alarm Pressure Switch: Water flow will activate an alarm by way of an alarm pressure switch.

1. UL listed or FM approved and compatible with system devices
2. Ability to be wired for Class A or Class B service
3. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Viking Corp.
  - b. Potter Electrical Signal Company

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, and other conditions where hose connections and stations are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 SPRINKLER SYSTEM PIPING APPLICATIONS

- A. Standard-Pressure, Deluge Foam/Water Sprinkler System, 175-psig Minimum Working Pressure:
1. NPS 1-1/2 and Smaller: Threaded-end, black, standard-weight, sch 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
  2. NPS 2: Grooved-end, black, standard-weight steel pipe, sch 40, grooved-end fittings; grooved-end-pipe couplings; and grooved joints
  3. NPS 4 to NPS 6: Grooved-end, black, standard-weight. Sch 40, steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

### 3.03 VALVE APPLICATIONS

- A. Where specific valve types are not indicated, the following requirements apply:
1. Listed Fire-Protection Valves: UL listed or FM approved for applications where required by NFPA 11, NFPA 13 and NFPA 16.
    - a. Shutoff Duty: Use ball, butterfly, or gate valves.
  2. Unlisted General-Duty Valves: For applications where UL listed or FM approved valves are not required by NFPA 11, NFPA 13 and NFPA 16.
    - a. Shutoff Duty: Use ball, butterfly, or gate valves
    - b. Throttling Duty: Use ball or globe valves

### 3.04 JOINT CONSTRUCTION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping joint construction.
- B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.
- C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall



provide on-site training for Contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products

1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings of the same manufacturer.
  2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings of the same manufacturer, unless otherwise indicated.
  3. All couplings must be installed in accordance with referenced standards. Follow manufacturer's instructions in all cases for all approvals and warranty enforcement.
- D. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials
1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.
  2. NPS 2-1/2 to NPS 4: Use dielectric flanges.
  3. NPS 5 and Larger: Use dielectric flange insulation kits.
- E. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

### 3.05 PIPING INSTALLATION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Engineer before deviating from approved working plans.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install grooved joint coupling flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13, if applicable.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler zone control valves, test assemblies, and drain piping.
- I. Install alarm devices in piping systems.
- J. Hangers and Supports: Comply with NFPA 13 and Specification Section 15060 for hanger materials.
  - 1. Install sprinkler piping according to NFPA 13 and NFPA 16
- K. Seismic Requirements: All piping shall be provided with seismic restraints in accordance with the seismic provisions of the International Building Code (IBC) 2003, Section 1621 and ASCE 7-02, Section 9.6, in conjunction with the current City of New York Construction Codes to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural notes on the Structural Contract Drawings and Specifications for site and structure specific seismic design criteria.
- L. Install pressure gauges on riser or feed main, at each sprinkler test connection. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gauges to permit removal, and install where they will not be subject to freezing.
- M. Pipe Expansion Provisions: Connect, support and guide piping to permit and control pipe expansion and construction and to accommodate building expansion, contraction and settling without damage.
  - 1. Providing piping expansion loops or expansion joints sized to accommodate possible expansion without exceeding allowable pipe and fittings stresses in straight sections of water piping more than 150 feet in length. Locate expansion devices midway between anchor points, and the pipes guided as recommended.
  - 2. Provide anchors for piping within a structure consisting of welded plates, angles, channels, or beams braced and securely fastened to the pipe and to structural members adequate to safely withstand resulting stresses.

### 3.06 VALVE INSTALLATION

- A. Install listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim sets, controls, and specialties according to NFPA 13 and NFPA 16 and authorities having jurisdiction.

- B. Install reduced pressure zone assembly with the bladder tank as required.

### 3.07 SPRINKLER APPLICATIONS

- A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:
  - 1. Rooms without Ceilings: Upright sprinklers

### 3.08 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect piping to specialty valves and accessories.
- D. Connect air compressor to the following piping and wiring, if applicable:
  - 1. Pressure gauges and controls
  - 2. Electrical power system
  - 3. Fire alarm devices, including low-pressure alarm.
- E. Electrical Connections: Power wiring is specified in Division 16.
- F. Connect alarm devices to fire alarm.
- G. Ground equipment according to Section 16060 - Grounding.
- H. Connect wiring according to Section 16121 - Wires and Cables - 600 Volts and Below.
- I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.09 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13, NFPA 14, NFPA 16 and in Section 15076 - Piping and Equipment Identification.

### 3.10 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
  - 3. Energize circuits to electrical equipment and devices.
  - 4. Flush, test, and inspect foam/water systems according to NFPA 16.
  - 5. Coordinate with fire alarm tests. Operate as required.
  - 6. Coordinate with fire-pump tests. Operate as required.
- B. Report test results promptly and in writing to Commissioner and authorities having jurisdiction.

### 3.11 CLEANING AND PROTECTION

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.
- C. Protect sprinklers from damage until Substantial Completion.

### 3.12 DEMONSTRATION

- A. Engage a factory-authorized service representative to train DSNY's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Section 01781 - Project Closeout and Section 01821 - Training.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 14511**  
**CONTAINER TRANSPORT SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the furnishing and installing of a Container Transport (Shuttle Car) System. Equipment described in this section shall be designed for heavy-duty use in material handling applications. The key requirements which shall be incorporated into the design and manufacturing of the system are as follows:
  - 1. Provide safe, stable transport of the containers without tipping or damage.
  - 2. Provide short cycles (one minute or less) with high reliability using a proven battery solution.
  - 3. Provide accurate stopping positions for crane loading and unloading of containers and lidding/unlidding operations.
  - 4. Allow Lidding Operator safe control of the shuttle car.
  - 5. Incorporate safety in all applicable operating aspects.
  - 6. Reduced maintenance costs.
- B. At the Marine Transfer Station (MTS), four shuttle cars are required, and one spare shuttle car for a total of 5 units.
- C. Each shuttle car shall be designed to carry and move a steel container filled with municipal solid waste having a total gross weight of 30 tons. Containers are 8.5 feet wide, 20 feet long, and 12 feet high, (Nominal) as specified in Section 14512.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 – Shop Drawings
- B. Section 01431 – Quality Assurance Inspection
- C. Section 01750 – Spare Parts and Maintenance Materials
- D. Section 01811 – Preliminary and Final Field Tests
- E. Section 01821 – Training
- F. Section 01831 – Operation and Maintenance Manuals
- G. Section 05120 - Structural Steel
- H. Section 05500 - Metal Fabrications
- I. Section 05521 - Exterior Pipe And Tube Railing
- J. Section 05532 – Stainless Steel Floor Gratings and Checkered Plates
- K. Section 08342 - Overhead High Speed Fabric Doors

- L. Section 09911 - Exterior Painting
- M. Section 10410 - Signs
- N. Section 14512 - Containers
- O. Section 14601 - Container Lidding System
- P. Section 16075 - Electrical Identification
- Q. Section 16080 - Electrical Testing Requirements
- R. Section 16121 - Wire And Cables-600 Volts And Below
- S. Section 16220 - Electric Motors
- T. Section 16264 - Uninterruptible Power Supplies
- U. Section 16491 - Control Components and Devices
- V. Section 17210 - SCADA System - Operator Workstation
- W. Section 17320 - SCADA System-Control Panels And Enclosures
- X. Section 17330 - SCADA System-Panel-Mounted Instruments And Devices

### 1.03 REFERENCES

A. Codes and Standards referred to in this Section are:

1. AISC - American Institute of Steel Construction
2. ASTM A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
3. CMAA - 70 Class F Service - Overhead Crane Class - Continuous Severe Service
4. ASTM - A 36/A 36m - Standard Specification for Carbon Structural Steel
5. ASTM - A 572/A572m - Standard Specification for High-Strength Low-Alloy Columbium - Vanadium Structural Steel
6. ASTM - A588/A 588m - Standard Specification for High-Strength Low-Alloy Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4 - in (100-mm) Thick
7. ASTM - A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
8. ASTM - A 490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
9. ASTM - A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
10. AWS - D14.1-97 - Specification for Welding Industrial and Mill Cranes
11. AWS - D1.1-97 - Structural Welding Code, Section 4

12. ASME – B30.2 Section 2-2.2 – Overhead and Gantry Cranes
13. NEMA – MG-1 – National Electrical Manufacturers Association – Motors and Generators
14. AGMA – 6035 – American Gear MFG. Assoc. – Design, Rating and Application of Industrial Global Wormgearing (Metric Edition)
15. AGMA – 6034-B – American Gear MFG. Assoc. – Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors
16. ABMA – 9 – American Bearing MFG. Assoc. – Load Ratings and Fatigue Life for Ball Bearings
17. ABMA – 11 – American Bearing MFG. Assoc. Load Ratings and Fatigue Life for - Roller Bearings
18. OSHA – 29 CFR CH. XVII Section 1910.179 9(e)(3) – Overhead and Gantry Cranes – Trolley Bumpers
19. NTEP – National Type Evaluation Program
20. NEC – Article 610 – National Electrical Code – Cranes and Hoists
21. NEC – Article 110-9 – National Electrical Code – Interrupting Rating
22. NEC – Section 610-42 – National Electrical Code – Branch Circuit Protection
23. NEC – Section 610-43 – National Electrical Code – Motor Running Overload Protection
24. NEC – National Electrical Code – Over-Current Protection

#### 1.04 GENERAL REQUIREMENTS

- A. In order to minimize the number of stocking spare parts all shuttle cars shall share common mechanical and electrical components.
- B. The Contractor's shuttle car manufacturer shall furnish the necessary labor, materials, equipment and incidentals required to provide a completely assembled and functioning system, unless otherwise specified herein.
- C. The Contractor shall ensure that the shuttle car manufacturer complies with applicable Federal, State and Local Laws in the manufacture, testing, shipment and assembly of the equipment.



- D. The shuttle car manufacturer shall be a company specializing in manufacturing and installing container transport shuttle car systems with not less than three (3) successful installations.
- E. The usage profile for the shuttle car operation is as follows:
1. The station's maximum design throughput is met with three shuttle cars in service.
  2. The shuttle car will complete a cycle in 15 minutes.
  3. The station will be operating for two shifts (16 hours) per day.
  4. The station will be in service six days per week.
  5. A complete cycle is defined below:

Step	Description	Location of Shuttle Car	Time
1	Gantry crane operator loads empty container from barge or storage onto shuttle car.	Pier area	1.5 minutes
2	Lidding operator confirms that shuttle car has a container on board. Both lidding operators simultaneously press two Inbound push buttons, and shuttle car moves from pier to lidding area.	In motion	0.5 minute
3	Lidding operators enter the shuttle car catwalks, and remove the container lid. Operators exit the shuttle car catwalks.	Lidding area	2 minutes
4	Both lidding operators simultaneously press two Inbound push buttons, and shuttle car moves from lidding area to loading area.	In motion	0.5 minute
5	Container is loaded with solid waste.	Loading area	6 minutes
6	Lidding operator confirms that container is full. Both lidding operators simultaneously press two Outbound push buttons, and shuttle car moves from loading area to lidding area.	In motion	0.5 minute
7	Lidding operators enter the shuttle car catwalks, and reapply the lid. Operators exit the shuttle car catwalks.	Lidding area	2 minutes
8	Both lidding operators simultaneously press two Outbound push buttons, and shuttle car moves from lidding area to pier area.	In motion	0.5 minute
9	Gantry crane operator removes container from shuttle car to barge.	Pier area	1.5 minutes
<b>Total Sequence Time:</b>			<b>15 minutes</b>

## 1.05 SUBMITTALS

- A. Submit information and data to show experience in producing similar equipment, providing evidence including contact information for at least 3 installations for which the manufacturer has completed.
- B. Submit complete working drawings, including complete dimensional information, catalog cuts of component parts and materials list, showing the location of all equipment and control devices, and all other information necessary to render a totally functional container transport system to the owner. Information submitted shall be in accordance with Section 01330 – Shop Drawings.
- C. Submit the rating and description of all motors, brakes, control, protective, and safety features.
- D. Submit Operation and Maintenance (O&M) instructions in accordance with Section 01831 – Operation and Maintenance Manuals.
- E. Submit certified test reports to confirm that the units produced meet the requirements of the field tests specified in the subsection titled “Field Quality Control”.
- F. Submit Acceptance Test Plan for container transport system, identifying method and procedure for factory test and for field test. Submit certified results of factory and field tests.

## 1.06 SPARE PARTS

- A. The Contractor shall submit for approval the equipment manufacturer's spare parts list in accordance with the procedures and requirements set forth in Section 01750 – Spare Parts and Maintenance Materials.
- B. The complete list of parts and supplies shall include current unit prices and source of supply.
- C. Furnish a listing and include those parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified herein to be furnished as part of the Contract. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. A separate number shall properly identify each part. Those parts, which are identical for more than one size, shall have the same parts number.
- D. A listing of additional items recommended by the manufacturer to assure efficient operation at the particular installation.
- E. The above lists shall be submitted with the operation and maintenance manual.

F. The following minimum spare parts shall be provided with the equipment:

1. One year's supply of lubricants necessary to maintain the shuttle cars
2. One motor and drive assembly
3. (4) Spare wheel assemblies complete with all parts and ready for installation; Two assemblies to be drive wheel assemblies and two shall be idler wheel assemblies
4. Eight (8) load cells
5. One (1) complete shuttle car pendant control with cable.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Acceptable manufacturers are listed below.

1. Ederer, LLC, Seattle, Washington
2. Pacific Central Steel Fabrication, Inc., Price, Utah
3. Jervis B. Webb, Farmington Hills, Michigan (formerly Mentor AGVS)
4. American Crane & Equipment Corporation, Douglassville, Pennsylvania
5. Or approved equal

### 2.02 SHUTTLE CAR SYSTEM AND COMPONENTS

A. Shuttle Car Parameters

Length:	22'-0" (maximum)
Width:	14'-0" (including 30" wide catwalks on each side of car)
Height:	13'-6" (maximum overall)
Carriage Ht.	2'-0" (maximum height load table)
Rail Spacing:	18'-0" (center of rail to center of rail)
Rail Size #	105 Lb. Crane Rail
Max Speed:	60 feet/minute bi-directional
Load Capacity:	30 tons
Catwalk Ht.:	10'- 0" above top of rail

B. Materials and Components

1. The shuttle car shall be top running type, constructed of either rolled structural shapes or built-up box section members fabricated by welding steel plates as may be required by the design into a rigid framework, properly aligned to act as a support for shuttle car transverse drive. Steel components shall be fabricated in accordance with Section 05120 - Structural Steel, and Section

05500 - Metal Fabrications, and as modified herein. The frame shall be reinforced to provide adequate support for the container including the impact load of five tons of municipal solid waste being dropped 15 feet into the container supported by the shuttle car. Box-type members shall be seal welded and all pockets and low points in the member where water can become trapped shall be provided with drain holes. Longitudinal joints of built-up members shall be made with continuous welds. The shuttle car structure shall be designed to stress levels as required by CMAA 70 Class F service. The shuttle car design shall be compatible with the runway rails.

2. Except as otherwise indicated herein, all materials furnished and work performed in connection with structural steel work shall be in conformity with the AISC "Manual of Steel Construction" latest edition. All materials shall be new and undamaged and shall conform to pertinent AISC and ASTM standard specifications and the following requirements. Structural steel shapes and plates shall conform to ASTM A36/A 36M, ASTM A 572/A572M, or ASTM A 588/A 588M
3. All fabricated materials shall conform to the tolerances specified in the AISC manual and ASTM A6. Holes and other provisions for field connections shall be accurate and shop checked so that proper fit will be provided when the units are assembled in the field.
4. Impact testing shall be performed on all steel used in the fabrication of the main load carrying members of the shuttle cars.
5. Connections: Holes for connections shall be of standard dimensions except for alignment connections where tolerance body bolts in reamed holes are used.
  - a. Shop Connections. Shop connections shall be designed for assembly by means of welding or bolting. Welding shall not be associated with bolting in the same joint. Field connections shall be designed for assembly with bolts of the type specified for the application. Riveting will not be acceptable.
  - b. Design of bolted connections shall be as follows:
    - (1) Machine bolts or fitted bolts shall be used for assembly connections on machine parts, trucks, shuttle car frames, attaching machine parts, and similar items.
    - (2) ASTM A 325 or ASTM A 490 type bolts shall be used on structural bolted connections carrying primary loads.
    - (3) ASTM A 307, ASTM A 325, or machine bolts shall be used for bolted connections on the guardrails, and similar structural items.

- (4) All speed reducers, bearing bases, and pillow blocks shall be held securely in place using machine bolts and shear bars.

## 6. Welding

- a. Welding operations shall be performed by certified welders and conform to AWS D14.1-97, Specification for Welding Industrial and Mill Shuttle cars. Welding operations for the shuttle car shall also conform to CMAA No. 70, except dimensional tolerances of AWS D14.1 shall remain applicable over CMAA No. 70 requirements.
- b. The requirements of AWS D1.1-97, Structural Welding Code, Section 4, shall apply to all welding except as modified in AWS D14.1-97 and as defined in ANSI B30.2. For the gas metal arc welding process (GMAW), the use of short-circuiting transfer mode is unacceptable. The flux-cored arc welding process (FCAW) shall use a supplemental external shielding gas. For shielded metal arc welding (SMAW), all filler metal shall be of the low hydrogen type. Low hydrogen electrodes shall be stored and handled during use in accordance with AWS D1.1-97, Part 4.5.2.
- c. Welded joints and materials shall meet the following requirements:
  - (1) Butt, grooved T, and corner joints shall be full penetration welds.
  - (2) Filler metals shall be 70,000 PSI minimum tensile strength.
  - (3) Tack welds shall be either incorporated into or removed from the final assembly. Only tack welds without defect may be incorporated into the final assembly.
  - (4) Welds shall be cleaned to remove all flux, scale, and weld spatter.
  - (5) Girder butt joint groove welds shall be 100% radio-graphed in accordance with AWS D14.1-97.
  - (6) Groove welds shall be terminated at the end of the joint by use of extension bars or runoff plates. Extension bars and runoff plates shall be removed upon completion and cooling off of the weld, and the ends of the weld shall be made smooth and flush with the edges of the abutting part.
  - (7) Welding electrodes shall be low hydrogen type.

## 7. Motors

- a. Motors shall be in accordance with Section 16220 - Electric Motors and be designed specifically for shuttle service and shall conform to the IP-67 Standards and shall be furnished with drive train, mated with flange and couplings as required for the drive train system. Motors shall be procured from domestic suppliers to assure availability of replacements. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - (1) Leeson
  - (2) General Electric
  - (3) Trust Automation
- b. Drive motors shall be 36, 48 or 72 volt, DC shunt wound, with class F insulation.
- c. Drive motors shall be TENV (Totally Enclosed Non Ventilated), wash down duty, and rated 60-minute duty, with corrosion protection.
- d. Drive motors shall be provided with anti-friction ball bearings and a normally closed thermostat.
- e. Drive motors shall be equipped with space heaters.
- f. The space heater circuit, for each motor equipped with space heaters, shall be interlocked with its associated motor starter so that the space heater circuit is energized at all times except when the mainline contactor is energized or the entire shuttle car supply circuit is de-energized.
- g. Provide thermal overload protection with automatic reset for all motors.
- h. Motors shall be capable of accelerating and running with rated load with applicable armature and field voltages up to and including 110 percent of the rated values of the selected adjustable voltage power supply.
- i. Horsepower shall be calculated for outdoor conditions as specified in Section 5.2.9.1.2.3 of CMAA 70 with a pressure due to a "typical" 35 mph wind, a friction factor of 15 lbs per ton, and a service class factor of 1.2. Wind force = 0.00256 times the wind speed, in miles per hour, squared (see CMAA 70). Controls shall also provide for operation in the occasional 50 mph head wind, while overloaded, as allowed per CMAA 70.
- j. The capacity of the shuttle car travel motor shall be sufficient to provide the specified performance without exceeding its full-load torque rating

including the torque required to overcome the operating wind loading of the shuttle car and container. The tractive effort, used to overcome the rolling friction of the wheels and mechanical losses of the drive, as specified in CMAA for the diameter of wheel utilized.

- k. The motor and drive shall be furnished as a system to provide variable speed and positioning control as required for operation of the shuttle car. The drive shall be located on the shuttle car and shall control the speed of the system. The drive controller shall operate on the supplied battery voltage and use voltage control for the speed of the motor from park through acceleration to running speed. The motor shall use electric braking from running speed to zero speed. The drive shall protect the motor from overload.
- l. The motor and drive shall be suitable for the usage profile specified and as required by system operation.

#### 8. Shuttle Car Drive System

- a. The shuttle car shall have a minimum of two (2) driven wheels, in a CMAA (Fig. 4.10.1-1) A-1 drive configuration. The drive shall consist of a fabricated steel gear reducer, a DC disc brake flange mounted to the motor and flexible drive shafts driving the wheels. The disc brake shall be sized for 100% of the full load motor torque.
- b. The shuttle car gear reducers shall be foot mounted off the shuttle car frame. The drives shall be designed so that the travel motion will be steady and have a minimum of vibration or racking while moving at rated speed, with a maximum rated load. Drives shall have the following features:
  - (1) Provide electronic shuttle car drive power control system. Provide the ability to smoothly accelerate to operating speed with power flow control.
  - (2) Provide brake control - provide the ability to reverse plug the drive.
  - (3) Oversize drive 300% based on motor current rating for continuous starting and stopping.
  - (4) Provide drive, which shall require no jumpers or potentiometer for set up.
  - (5) Provide a totally modular design.
  - (6) Provide brake contactors.

- c. Mechanical Efficiencies: The mechanical efficiencies used for calculating the required transverse horsepower shall be as a minimum shown in Section 5.2.9.1.2.3 of the CMAA 70 Specification.
- d. The efficiencies used for worm gear reductions, if used, shall not exceed those determined by AGMA 6017-E and AGMA 6034-B, with efficiencies of bearings and seals taken as not greater than 99 percent per pair of bearings.

9. Gearing and Speed Reducers

a. General

- (1) All gear reductions shall be contained in speed reducer. Speed reducers shall be finished to AGMA No. 12 quality or better.
- (2) All gearing and speed reducers shall be designed in accordance with the applicable AGMA Standard. The design of the gearing and speed reducers in accordance with other standards such as FEM or DIN is unacceptable.

- b. Gears: The reducer assemblies shall be rated in accordance with AGMA Standards. The design of gears for built-up speed reducers shall be in accordance with the requirements of CMAA 70 for Class F service. The rating of commercial speed reducers shall be based either on the AGMA catalog rating of the speed reducer with a 1.5 service factor applied or the shuttle car manufacturer's calculated durability and strength rating of the gears. If the rating is based on the durability and strength rating of the gears, the design of the gears shall be in accordance with the requirements of CMAA 70 for Class F service, and the manufacturer shall submit gear design computations in accordance with AGMA Standards for approval. Overhung gears or pinions shall not be permitted. Pinions shall be forged integral with the shaft where practicable. Gears shall be pressed or shrunk on the shaft. Welding of defective gear teeth will not be permitted. All gearing shall be fully enclosed in speed reducers and provided with a means of lubrication.

c. Speed Reducers

- (1) Speed reducers may be a standard catalog product of a speed reducer manufacturer (commercial speed reducer) or of special design for the specific application (built-up speed reducer).
- (2) Speed reducers shall be entirely self-contained in an oil-tight, fabricated steel housing designed to maintain shafts and bearings in accurate alignment. Reducers will be split along the gear line for ease of maintenance. Gear reducers shall be mounted such that



the split along the gear line is horizontal. The vertical mounting of speed reducers shall not be permitted. All bearings shall be heavy-duty, anti-friction, roller type, with a minimum L-10 bearing life of 40,000 hours. Bearing caps/retainers will be provided on all bearings to permit inspection. All high-speed gearing shall operate in an oil bath. Oil gauges shall be conveniently located. The design of the speed reducers shall provide for draining, oil level indication, and ventilation of each speed reducer. Speed reducers shall be bolted and provided with alignment bars to assure they are securely mounted.

#### 10. Gear Cases

- a. All gears shall be enclosed in oil-tight cases unless otherwise specified. The cases shall be provided with seals compatible with the lubricant suggested, drain plugs, breathers, oil level dip stick or sight glass, lifting lugs, and an oil-tight inspection cover which can be removed for inspection of the gears. Gear cases shall be provided with means of cleaning and draining without dismantling the equipment. Drain plugs shall be accessible, and, where necessary, shall be piped to convenient locations. Gear cases shall be of steel or ductile-iron construction and shall be designed to be sufficiently rigid to maintain proper alignment of the gearing under all load conditions. Gear cases shall be horizontally split along the gear line. Bearings shall be mounted in machined surfaces with removable bearing retainers for inspection. Each gear case shall be provided with a strip heater.
- b. External Gears: External gears and pinions are not permitted.

#### 11. Bearings

- a. Except where otherwise specified, bearings may be of the roller or ball type. Bearings shall be so designed as to be easily replaceable and shall be placed as close as possible to the points of loading. Pillow blocks shall mount to solid bases and be securely bolted in place.
- b. Antifriction bearings shall be of standard types most suitable for the respective application and shall have both inner and outer races. Ball and roller bearings shall conform to the applicable requirements of the ABMA 9 and ABMA 11. The manufacturer's published rating shall be used in determining the bearing capacity. Bearings, except as noted below, shall have a minimum L-10 life of 40,000 hours for CMAA Class F service, and shall be designed for the loads and speeds resulting from the specified shuttle car performance.
- c. For wheel bearings, half of the total wheel load shall be applied to each bearing. Wheel bearings shall also be sized for the thrust loads as

specified by CMAA 70. Wheel bearings shall be designed for axial loads of not less than 15 percent of the radial wheel load. The wheel bearings shall be heavy-duty; lifetime lubricated Timken AP-2 railroad tapered roller bearings. As an alternate to the AP-2 bearings and to facilitate replacement, the shuttle car manufacturer can choose to supply tapered bore spherical roller bearings with a hydraulic removal feature, similar to that supplied to the steel mill industry to allow easy removal of the wheel bearings. The manufacturer shall also supply the hydraulic removal tools necessary to change the spherical roller bearings.

- d. Bearings shall have oil-tight enclosures and shall have synthetic rubber spring-loaded seals with one element to retain the grease and another synthetic rubber element to exclude foreign matter.
12. Couplings: Flexible couplings shall be of the gear type and have a sufficient capacity to develop the full strength of the shafting that they connect. Flexible couplings shall be pressed and keyed thereon. In determining the coupling capacity, the manufacturer's published rating shall be divided by a service factor recommended by the coupling manufacturer. Couplings with sleeves held in place or retained by snap rings are not permitted. A flexible coupling shall be provided at the motor to the reducer connection. Rigid steel plate guards shall be provided for all exposed couplings, and shall be easily removable for maintenance.
13. Wheels, Axles and Wheel Loads
- a. Shuttle car wheels shall be double flanged and shall be made from solid wheel blanks with a hardness of at least 60 RC via the deep hardening carbonizing heat treatment process. The wheels shall be turned or ground to true and uniform diameter and shall have straight treads. Tread diameters on drive wheels shall be matched to 0.001" per inch of diameter. Wheels shall be pressed and keyed to the wheel axles. Wheel sizing shall be per CMAA guidelines for the loading, class of service, and shuttle car rail size, except that for the purpose of wheel size selection, the charts and formula for a 320 BHN wheel shall be followed.
  - b. Wheel Loads: The static design load on any shuttle car wheel shall be taken as the load resulting from the rated live load of the loaded container and any applicable dead loads. Loads resulting from the maximum torque of the motor, impact or wind loading need not be considered in determining the wheel sizes. The design load on any wheel shall not exceed the values given in CMAA 70 Table 4.13.3-4 for the size of rail chosen and an assumed wheel hardness of 320 BHN.
  - c. Bolted parts of the shuttle car drive shall be machine finished at the bolting surfaces. Assemblies shall be arranged to minimize the danger

of injury to the car or surroundings in case of failure of any part of the assembly or wheel. Lugs shall be provided on the assembly frames to limit the drop to not more than 1 inch in case of a broken axle.

#### 14. Lubrication

- a. Oil lubrication shall be provided for gear trains and speed reducers.
- b. Lubrication for other mechanical operating parts shall be by means of high-pressure Alemite or equal 1/8-inch button head fittings. The lubricating fittings of journals or bearings shall be readily accessible, and, where necessary, shall be piped to convenient points using stainless steel pipe of ample size, adequately fastened with grommets and clamps to prevent vibration during shuttle car operations.
- c. Drain and fill plugs of speed reducers and gear cases shall be located to be readily accessible and shall be provided with extension piping where required. The speed reducers shall have filtered breathers as recommended by the manufacturer for outdoor service.
- d. Lubricating oil for speed reducers and gear couplings shall have good resistance to foaming under normal operating conditions and shall be non-corrosive to speed reducer components. The oil shall have a pour point of -20°F or lower and shall be suitable for infrequent intermittent duty operation of the speed reducers within a temperature range from -5°F to 120°F. The oil shall be in accordance with the recommendation of the manufacturer of the speed reducers for the temperature specified.

#### 15. Stopping and Positioning

- a. Proximity magnetic plates or other devices shall be installed to control shuttle car movement in each of the three stop locations, the Outbound Pier Position, the Lidding/Delidding area, and the Inbound Loading Position, and stop the car accurately within +/- 3/8" in the same position each time. The magnets or plates shall be installed flush with the top of the slab. Install per Section 05500 – Metal Fabrications.
- b. Obstacle Detection System (ODS): Shuttle cars shall have a non-contact sensing system to stop the shuttle car when an obstacle is detected. Four (4) sensors shall be provided and mounted on the inboard and four (4) sensors mounted on the outboard side of the shuttle car. The ODS shall detect stationary and moving objects within the path of the shuttle car and bring it to a controlled stop. The devices shall emit infrared light and monitor the infrared light reflected back. The ODS shall have two zones. The first zone shall begin approximately seven (7) feet in front of the sensor. When the first zone is triggered the shuttle car drops its speed to half. The second shall begin approximately 3 to 4 feet in front of the

shuttle car. The second zone causes the shuttle car to come to a controlled stop. When the second zone is cleared (Obstacle is removed) the shuttle car can be signaled via push button command to resume operation.

The sensors detection distance shall be adjustable by turning set screws located on the face of the sensor.

- c. In addition to the pier and inside building mounted bumper end stops, shuttle car bumpers shall be provided as well as the non-contact sensing system described above; each shuttle car shall be equipped with a bumper system (described below) protecting the traveling direction of the car, mechanically connected to a switch that shall stop the shuttle car immediately when the bumper contacts an object in its path.
- d. The trip point of all limit switches shall be located to allow for maximum run out distance of the motion being stopped for the braking system being used.
- e. All directional limits may be disengaged by selecting motion in the opposite direction.

#### 16. Brakes

- a. Drive motors shall have spring applied electrically released fail-safe brakes. The brakes shall be selected and rated in accordance with Section 4.9 of CMAA 70 as a minimum unless specified otherwise herein.
- b. Magnetic holding brakes shall be of the electric released spring set type attached to the motor or reducer high speed shaft. Brakes shall be readily adjustable and equally effective in both directions. Brakes are to provide smooth, predictable operation throughout the entire range of the shuttle car motion.
- c. Brakes shall have a conduit connection box, corrosion resistant pins, and a manual release.
- d. The transverse drive shall be provided with a direct-acting DC coil brake, DTWP, disc type electric holding brakes, flange mounted to the accessory end of the motor. The disc brakes shall be sized for 100% of the full load motor torque, with thermal capacity sufficient to allow for three consecutive emergency stops with full load and an adverse operating wind, and shall not cause wheel slip upon setting. Brakes shall be capable of stopping as required by CMAA 70. All brakes shall be provided with a space heater and a manual release lever.

- e. The holding brake shall be applied automatically when power to the brake is removed. All brakes shall be released only when sufficient electric power is applied to the brake coil through the motor circuit.
- f. Select coil time rating for the duration and frequency of operation for the class of service specified. Transverse drive brakes used only for emergency stops on power losses, or setting by operator choice shall have a coil rated for continuous duty.

#### 17. Shuttle Car Bumpers

- a. Four elastomeric, hydraulic or coil spring bumpers shall be provided on the shuttle car. The bumpers shall be sized per OSHA 29 CFR Ch. XVII Section 1910.179(e)(3) criteria and be capable of stopping the shuttle car with a container (30 tons total live load) when traveling in either direction at rated speed with brakes and power off.
- b. Shuttle cars shall have, at each wheel, brushes or other mechanism to ensure rails are kept free of debris.
- c. The shuttle shall have protective side, front and rear skirts or other means to minimize the gap between the rail and the bottom of the shuttle car. This gap shall be no more than 1/2" as measured from the surface of the concrete to the bottom of the shuttle car.

18. Container cell guides shall be provided as shown at each corner of the shuttle car for container placement on the shuttle. Cone guides mounted on the load table to line up with each corner block of the container for final positioning shall also be provided. The container cell guides shall extend to a minimum height of one foot above the shuttle car walkway.

#### 19. Container Weighing System

- a. Load cells shall be mounted below the load table of each shuttle car. System shall include four (4) stainless steel load cells. Load cells shall have mechanical stops and rubber footing attached to the rocker pin, to protect them from overloading, and have a service factor of at least 2. Due to the tamping of the load in the container, the scale shall have a delay and a damping feature to allow the load to settle for an accurate reading. Furnished load cells shall have a hermetically sealed sensing unit and sealed cable entry, and cable that is either sheathed in stainless steel or run in conduit. Scale system shall be accurate, to within 3% of full load. Components used in this application shall be National Type Evaluation Program NTEP approved.
- b. Cables from each load cell shall be wired to an on-board device that will compute the total weight, and deliver this information to the Shuttle Car

Control System. The manufacturer shall include the on-board device software that, in addition to the summing of the load cell signals, includes diagnostics for each load cell, scaling factors for calibration and a local display.

- c. Provide a large wall-mounted display system above each loading slot in the Loading Area to indicate as specified. The system shall include the indicator, a "Ready" light above each shuttle car bay mounted in the lidding area, a battery-powered handheld remote controller with corresponding receiver, programming of the container transport control system to correctly display the specified information, and all gateways, programming, power supplies and appurtenances necessary to provide a complete working system. Communication between the Shuttle Car Control System and the large display shall be via the network as shown.

(1) Indicator

- (a) Number of characters: Twelve
- (b) Digit Size: At least 8 inches high
- (c) Digit Type: LED
- (d) Enclosure: NEMA 4X Stainless Steel
- (e) Lens: Acrylic
- (f) Power: 120 VAC
- (g) Input: Ethernet
- (h) Manufacturers
  - (1) Vision Information Systems, Inc.
  - (2) Electronic Displays, Addison, IL
  - (3) Or approved equal

(2) "Ready" light

- (a) Provide wall mounted LED strobe light to indicate that the shuttle car container is ready to be moved from the loading area to the lidding area.
- (b) Color: Green
- (c) Power: 120 VAC
- (d) Manufacturer: Edwards 105 Series or equal

(3) Handheld Remote Controller

- (a) Provide battery-powered handheld remote controller radio frequency transmitter capable of sending four unique digital commands to the corresponding receiver.

- (b) Enclosure: IP66
  - (c) Keypad: Sealed membrane
  - (d) Battery: AAA lithium
  - (e) Transmit Channels: Eight
  - (f) Transmit Frequency: Spread Spectrum
  - (g) Quantity: Two
  - (h) Provide battery charger and a spare set of rechargeable batteries. Provide a waterproof pouch with lanyard for each controller.
  - (i) Manufacturer: BWI Eagle Air-Eagle Transmitter or approved equal.
- (4) Remote Control Receiver
- (a) Provide radio frequency receiver with antenna, paired with the transmitter specified above, capable of receiving four unique digital commands from the transmitter.
  - (b) Power: 120 VAC
  - (c) Relay Contacts: SPDT 5 A at 120 VAC
  - (d) Enclosure: NEMA 4X
  - (e) Manufacturer: BWI Eagle Air-Eagle Receiver or approved equal.
- (5) Programming
- (a) Provide programming for the container transport control system to display the specified information on the indicator and control the "Ready" light.
  - (b) The indicator shall display the net weight of the contents of the container while a container is:
    - (1) Present on the container transport car.
    - (2) The container transport car is stopped at the loading slot.

- (c) The indicator shall display "DO NOT DUMP" if the above conditions are not met.
- (d) The "Ready" light shall be energized when the handheld remote controller button is pressed.
- (e) The "Ready" light will be de-energized when the shuttle car moves away from the loading slot.

## 20. Warning Systems

- a. Shuttle cars shall be equipped with a white highly visible flashing beacon visible to the gantry crane operator as shown in the Contract Drawings. The flashing beacon shall be mounted in an open top box configuration to provide the maximum illumination and focus the light upward. The beacon will activate only when a weight of at least 18,000 lbs is detected, and only when the shuttle car reaches the outbound pier position. Flashing beacons shall be as specified in Section 17330 – SCADA System – Panel Mounted Instruments and Devices.
- b. Near or on the electrical panel mounted on each shuttle car, the car shall include:
  - (1) Power Available Light: Provide a green "Power Available" light that will turn on when power is available at the control.
  - (2) Power On Light: Provide a red "Power On" light that will turn on when the Main contactor has energized.
  - (3) Obstacle Detection System (ODS): Provide flashing amber light that will activate when the ODS detects an obstacle in the shuttle cars travel path.
  - (4) Shuttle Car Overload: Provide flashing red light that will activate when an overload has been sensed.
- c. Each shuttle shall have a minimum of two amber flashing beacons and adjustable audible warning alarm to indicate movement of the shuttle car. The equipment shall be as specified in Section 17330 - SCADA System – Panel Mounted Instruments and Devices.

## 21. Labels

- a. Provide adequate warning labels to comply with OSHA requirements and to ensure a safe operating environment.



- b. Capacity plates on shuttle cars will indicate capacity and be sized accordingly so that the shuttle car capacity can be read clearly from the ground.
  - c. Manufacturer required service, operation or safety warnings.
- 22. Two 30-inch wide walkways/platforms with handrails shall be provided along the long sides of the car for operators to remove the container lid as shown on the Contract Drawings.
- 23. The walkways shall provide a clear passageway of no less than 30 inches, shall be floored with steel checker plate or grating, and shall be provided with a 4-inch minimum high toe plate at all open edges except ends which are to be designed to align with building mounted finger walkways. Walkway surfaces of the Shuttle Cars shall be in accordance with Section 05532 – Stainless Steel Floor Gratings and Checkered Plates.
- 24. Hand railings shall be provided along the open sides of walkways, platforms, stairs, and at other locations where required for maintenance access and safety, except ends, which are to be designed to align with building mounted finger walkways. Handrails shall be in accordance with Section 05521 - Exterior Pipe and Tube Railing, and as modified herein.
- 25. Runway Rails
  - a. Rails for the shuttle cars operation shall be placed slightly above the top of the Pier Level slab as shown.
  - b. The rails shall be connected to one another with splice bars, shall be continuously supported. (See Structural Contract Drawings for the rail support and anchoring details).
  - c. Four fixed bumper end stops shall be provided and installed as shown on the Contract Drawings.
  - d. The fixed bumper end stops shall be of steel construction, accurately installed to meet the shuttle car bumpers squarely. The centerline of contact shall not be lower than the centerline of the wheel axles.
- 26. Given the height of the container cell guides, the possibility exists to derail the shuttle car when lifting or lowering a container into the shuttle car. An anti-derailing device shall be provided on the car to prevent the shuttle car from the possibility of derailing. The Contractor shall submit details of their manufacturer's proposed anti-derailing device with its Shop Drawing submittal.

27. The Contractor shall provide an Emergency Pullout System. The system is shown on the Contract Drawings. Its purpose is to pull a car and loaded container out of the station in the event of a mechanical breakdown of the shuttle car. Four, swivel hoist rings as manufactured by Crosby Group, Tulsa, OK or approved equal, shall be provided by the Container Transport System equipment manufacturer and be mounted on the shuttle cars as shown. The swivel hoist rings shall also be used as lifting rings for placement of the shuttle car on the rails, and shall be of the capacity necessary to lift the weight of a fully assembled shuttle.

## 2.03 SHUTTLE POWER AND ELECTRICAL REQUIREMENTS

- A. The electrical equipment contained in this specification is intended to cover a floor running traveling shuttle car for operation with a direct current power supply.
- B. The shuttle car manufacturer shall furnish and mount on the shuttle cars all electrical equipment, control panels, conduit and wiring, unless otherwise specified. If it is necessary to partially disassemble the shuttle car for shipment, all conduit and wiring affected shall be cut to length and identified to facilitate re-assembly.
- C. Wiring and equipment shall comply with Article 610 of the National Electrical Code (NEC), and Section 16121 – Wires and Cables – 600 Volts and Below.
- D. Electrical components shall be designed and rated in accordance with the applicable NEMA standard. The use of design standards other than NEMA such as IEC is unacceptable. All electrical components used shall be readily available from third party distributors and electrical wholesalers located in the Eastern United States.
- E. A shuttle car disconnecting means, either a current-rated circuit breaker or motor rated switch, lockable in the open position, located in an easily accessible location on the side of the car, shall be provided in the leads from the battery.
- F. The continuous rating of the switch or circuit breaker shall not be less than 100% of the combined short time motor full load currents, plus any additional loads fed by the device.
- G. Power circuit fault protection devices shall be furnished in accordance with NEC Section 110-9 Interrupting Rating. The shuttle car manufacturer shall state the interrupting rating being furnished.
- H. Branch circuit protection shall be provided per NEC Section 610-42 Branch Circuit Protection.
- I. Magnetic mainline contactors, shall be as shown in Tables 5.6.6-1 and 5.6.6-2 of CMAA 70. The size shall not be less than the rating of the largest primary contactor used on any one motion.

- J. Motor running overload protection shall be provided in accordance with NEC Section 610-43 Motor Running Overload Protection.
- K. Control circuits shall be protected in accordance with NEC Section 610-53 Over-current Protection.
- L. Under-voltage protection shall be provided as a function of each motor controller, or an enclosed protective panel, or a magnetic mainline contactor, or a manual-magnetic disconnect switch.
- M. Operator controls with the exception of local controls shall utilize momentary contact push buttons.
- N. Motor control equipment shall provide under voltage and overload protection for all motors.
- O. All motor and control terminals, upon which field connected circuits are to be terminated, shall be clearly and permanently identified. Terminal identification shall correspond with that indicated on schematic wiring diagrams. Electrical items used shall be in accordance with Section 16075 - Electrical Identification.
- P. Electrical design and installations shall be in accordance with the requirements of NEC Article 610, ANSI, NEMA, NFPA 70 standards, and with applicable state and local codes. Electrical components shall be shipped pre-wired to the largest extent practical. Wiring diagrams and tagged cables shall be provided for all items to be wired at the site.
- Q. Motors, controls, and other electrical devices shall be furnished in accordance with Section 16220 - Electric Motors, and Section 16491 - Control Components and Devices.
- R. A manual magnetic disconnect switch shall be provided. The switch shall be operable by handle at the control panel mounted on the shuttle car or remotely from the Lidding Operator's station. The main disconnect switch shall be capable of being padlocked in the "off" position.
- S. All junction boxes and control panels shall be outdoor rated, stainless steel NEMA 4X rated construction, meeting the requirements of Section 17320 - Control Panels and Enclosures.
- T. Battery Type And Charging System
  - 1. The shuttle cars will be in operation on an intermittent basis over a daily 16-hour waste handling period. Each shuttle car shall be battery powered with a single sealed gel electrolyte battery system. The battery system shall be maintenance free, never needing electrolyte or water to be added. The electrolyte shall be immobilized within each battery cell; the system shall

include valve-regulated or Absorbed Glass Mat (AGM) technology which shall replace traditional vent caps, making the battery system leak proof/spill proof and environmentally safe. Flooded cell lead acid batteries are not acceptable. These sealed battery systems shall prevent exposure to the hazards of hydrogen gas which is generated during recharge on standard flooded batteries. The battery system shall be as manufactured by a manufacturer regularly engaged in the manufacture of gel-electrolyte battery systems. The battery system shall be as manufactured by Storage Battery Systems, Inc., or other battery manufacturer regularly engaged in the manufacture of gel-electrolyte battery systems. -

2. The system shall be designed to operate in a temperature range of  $-5^{\circ}\text{F}$  to  $+120^{\circ}\text{F}$ . A detailed amp/hour demand study shall be completed and submitted for approval to show the batteries ability to meet the 16-hour handling period with or without "Opportunity Charging" at the most extreme temperature conditions. The charger shall monitor the battery cell temperature and automatically compensate the charging algorithm based on cell and ambient temperature. The gel-electrolyte battery system shall also be sized with sufficient number of cells to operate for the full 16 hours of operation and only have been discharged less than 30%.
3. Battery capacity shall be sized according to industry standard and manufacturer's recommendations on depth of discharge. The depth of discharge for the 16-hour operational shift shall not exceed 20% on gel cell batteries (80% capacity remaining).
4. The battery shall be protected from UV exposure when mounted on the shuttle car. If the mounting does not provide UV protection for the battery and case, the battery shall be furnished with a UV resistant housing, and designed specifically for use with gel-electrolyte battery systems
5. 'Opportunity Charging' shall allow for automatic recharging of the shuttle car batteries as the shuttle car stops at a fixed position under the Loading Slot. Each shuttle car shall have its own battery charging system, which shall consist of a wall mounted battery charger, charging shoe, and collection plate (Shuttle car mounted), located as shown. Power shall flow only upon contact and the system be designed to charge each shuttle cars batteries. Recharging the batteries shall be accomplished without removing them from the shuttle car.
6. The Opportunity Charging system shall be an intelligent microprocessor controlled charger with diagnostic features. The charging system shall have the ability to be used in a float charge, a deep discharge "swap" fashion or in an opportunity charge fashion. Charging and cool-down time for a full charge shall not exceed 8 hours. During the eight-hour period the equipment is not in use, the shuttle car shall be parked under the Loading Slot, where the batteries will receive their full charge. The battery charger shall compensate for battery

cool-down and shall monitor battery cell conditions including temperature and voltage. The battery chargers shall be "Eclipse II" series as manufactured by AMETEK, or approved equal.

7. The equipment manufacturer shall provide two (2) additional batteries as spares including a stand-alone spare battery charging system and two (2) battery storage racks.
8. Battery mounting shall be designed to allow easy removal and replacement of the battery using the forklift specified in Section 11562.
9. The charging system shall be able to charge the battery provided automatically with no programming required. Software shall be provided to monitor the charge current, battery voltage, cell temperature, voltage per cell; charge time elapsed, charge time remaining and the amps returned. The system software shall continually diagnose the battery and stop only when the battery is fully charged.
10. The charging system shall also include state of the art diagnostics that include:
  - a. Self-check during start up
  - b. Faults in AC service or DC output
  - c. Over-discharged battery
  - d. Battery fault
  - e. Cell temperature
  - f. Ambient Temperature
11. A Battery Status Indicator panel shall be provided and located next to the battery storage rack. The panel shall be at an easy viewing level for operators.
12. Conduit and wiring to connect electrical devices, electrical equipment and control panels furnished and installed by the shuttle car manufacturer that are not mounted to the shuttle car, will be provided by the Contractor.

## 2.04 SHUTTLE CONTROL SYSTEM

- A. The operator shall have the ability to control the shuttle cars from either of two areas, based on a local/remote selector switch on the outboard lidding area control panels. The areas where control shall be provided are the shuttle car pendant and lidding area.
- B. Control of the shuttle car from other than the pendant shall require the controls to be transmitted via the wireless network. The shuttle car manufacturer shall supply the digital communication equipment for all shuttle communication requirements. All drivers, cables, converters and ancillary equipment necessary for a complete system shall be provided.

C. Shuttle Car Control: A pendant-style control station shall be provided on each shuttle car. The control station cable shall be attached to the car with a quick disconnect coupling. The station shall have the following controls:

1. E-Stop mushroom head-style push button (operable in any mode).
2. Controls for Inbound, Stop, and Outbound movement, operable in local mode. Controls shall require constant operator pressure to maintain movement of the shuttle car. For example, if a joystick is used, the joystick shall spring-return to the STOP position. The joystick shall control the speed of the shuttle car as well as the direction of travel. The distance that the joystick is displaced from the STOP position shall translate into the speed of motion in the direction displaced.

D. Lidding Area Control

1. Wall-mounted NEMA 4x stainless steel control panels, on the inboard and outboard sides of the lidding area, shall be provided and located as shown. When the selector switch on the outboard lidding area control panel is in the Remote position, the lidding area control panels shall control the shuttle car. See Section 14601 – Container Lidding System for additional system operating features.
2. Two outboard control panels shall be provided as shown per station. Each of these panels shall control two Container Transport Systems, and contain the controls for the high-speed roll-up doors. Four inboard control panels shall be provided as shown per station. Each of these panels shall control one Container Transport System. The panels shall include the following controls:
  - a. Local/Remote selector switches (outboard panels only).
  - b. E-Stop mushroom head-style push button (operable in any mode).
  - c. Push buttons for shuttle car movement shall be provided at each control panel. Where noted below for operator safety, both inboard and outbound mounted push buttons must be pressed simultaneously before the shuttle can move to its next position. Provide the following push buttons:
    - (1) Pier area to lidding area (Outboard control panels only)
    - (2) Lidding area to loading area (Both panel push buttons simultaneously)
    - (3) Loading area to lidding area (Inboard control panels only)
    - (4) Lidding area to Pier area (Both panel push buttons simultaneously)

- d. Indicating lights for each inboard and outboard control panel. Location indicating lights will energize when the shuttle car is stopped at that location. Both lights will energize when the shuttle car is between two locations.
    - (1) Pier area
    - (2) Lidding area
    - (3) Loading area
    - (4) Trouble
  - e. Push buttons (Hardwire to door control panel) for open and close operation of the high-speed roll-up doors (Outboard panels only).
  - f. The shuttle system control panels shall be in accordance with Section 17320 – SCADA System – Control Panels and Enclosures. The shuttle car equipment manufacturer shall program the shuttle car system.
- E. Shuttle Car Interlocks: Provide the following interlocks:
- 1. Obstacle Detection System (ODS): Regardless of control station commands, detection of an obstacle shall stop the shuttle car.
  - 2. Bumpers: Regardless of control station commands, detection of an obstacle shall stop the shuttle car.
  - 3. End stop points: Regardless of control station commands, the shuttle car shall detect the end point and stop.
  - 4. Area stop point: Regardless of control station commands, the shuttle car shall stop at the Outbound Pier Position stop point, the Lidding area stop point, and the Loading area stop point. After stopping, a subsequent command to move shall activate the shuttle car.
  - 5. For remote operation, the door shall be opened and closed automatically from signals from the container transport system via the outboard control panel. The shuttle control system shall monitor the position/location of the shuttle car at all times. Based on the position of the car, the system shall open the door immediately prior to moving a shuttle car into or out of the building, and shall close the door immediately after the shuttle car passes through the door. See Section 08342 – Overhead High Speed Fabric Doors for additional description and requirements.
  - 6. Power fail protection: The shuttle car control system shall be designed such that the system shall fail to a safe state in the event of a power failure. Upon loss of network communications to any component, the shuttle car control system shall abort its operation and fail to a safe state.

## 2.05 SHUTTLE CAR CONTROL

- A. Provide two (2) identical "System Control" Personal Computer (PC) Systems. The Container Transport System Control Computers shall be provided in accordance with Section 17210 – SCADA System – Operator Workstation, and as modified herein.
- B. One system shall act as a backup system in the event of an equipment failure, allowing for continued use of the Container Transport System.
- C. The Container Transport System Computers shall, to the maximum extent possible, provide information displayed in a graphical format. The system shall display, monitor and control as a minimum, the following system functions and events:
  - 1. Monitoring
    - a. Motor failure
    - b. Brake system failure
    - c. Inferred sensors: obstacle detected
    - d. Mechanical bumper: obstacle detected
    - e. Shuttle car failure
    - f. Weighing system failure
    - g. Battery recharging system failure
    - h. Wireless network failure
    - i. Battery voltage level
    - j. Container weight
    - k. High speed door trouble
    - l. High speed door open
    - m. High speed door closed
    - n. Mode selector switch position (local/remote)
  - 2. Control
    - a. Control shuttle car movement based on push button contacts on lidding area control panels when in Remote mode. The control system shall stop each shuttle car at each defined point. The control system shall ramp up, drive, and ramp down the speed of the car automatically.
    - b. A stop soft push button shall be provided on each display screen. Activation of this button will override local push buttons and auto controls.
  - 3. Display
    - a. Shuttle cars location: Provide a display showing all shuttle car bays, tracks and cars. Show actual position of each car on display.



- b. Show all monitored data listed above.
- c. Calculate and show total run time for each shuttle car.
- d. Determine final rollout weight for each shuttle car trip.\
  - (1) Record and display final rollout weight.
  - (2) Totalize all final rollout weights by bay per day.
  - (3) Totalize all final rollout weights by station per day.
  - (4) Alarm on high rollout weight (over 22 tons).
  - (5) Display loading weight as container is filled.
- D. The Container Transport System computers shall have the ability to have certain signals and information monitored by the building's SCADA System. Shuttle car monitored signals forwarded to the SCADA system shall include the following:
  - 1. Failure of Each Shuttle Car (4)
  - 2. Shuttle Bay Door (4) Open.
  - 3. Shuttle Car Safety Stop Command Given (4)
- E. Provide a UPS unit sized for 30 minutes running the control system. The unit shall be per Section 16264 – Uninterruptible Power Supplies.
- F. Provide 802.11g Ethernet wireless set working cards to transfer information between each shuttle car and the control system as shown.
- G. Wireless communication system shall include all mounting and wiring. The radio shall operate in a manner that provides seamless and continuous communications between the shuttle cars and the System Control PC via the wireless network.
- H. The shuttle car radio communications system shall conform to FCC regulations and CE regulations for noise generation and immunity.
- I. Furnish and install on each system control computer the software necessary to provide a fully functional system as specified. Configure system, setup and demonstrate system software. Two software packages and two user licenses shall be provided for each station.

## 2.06 PAINTING OF EQUIPMENT

- A. The shuttle car equipment shall be painted in accordance with Section 09911-Exterior Painting.
- B. Purchased equipment such as motors, brakes, etc. shall be left with the manufacturer's standard finish, which shall be specified for a marine environment.

## 2.07 SOURCE QUALITY CONTROL

### A. General

1. Factory tests shall be run on one container transport system. Tests shall be conducted at the manufacturer's shop, and shall be witnessed by the Engineer.
2. Factory test methods, procedures and scheduling shall be submitted for approval. Approval of the factory test plan is a prerequisite for conducting the test.
3. Factory test shall be run only after all major shop drawings have been approved.
4. The Contractor shall submit a report of the results of the factory test for approval. The report shall include all test results, including malfunctions, failures, and any remedial actions.
5. No component or system shall be delivered to the site until the factory test report submitted has been approved.
6. Acceptance of any factory test shall not relieve the Contractor of responsibility for complying with the Contract Documents.

### B. Factory Tests

1. Fit and Alignment: The structural frame shall be fully assembled, and checked for fit and alignment prior to shipping. The fit of all equipment such as shuttle car, drive, etc. shall be verified. The test shall demonstrate that the various parts and components are correctly fabricated, assembled, and fitted. A container shall be placed on the car to inspect clearances between the container and the car, and cell guides and cone guides placement. Container shall be provided by the Contractor. The contractor will be responsible for the shipping, handling, and removal of container during the process of the factory test.
2. Safety Devices Test
  - a. Test all safety devices in both directions of travel, including mechanical bumpers, obstacle detection sensors, emergency stop push buttons, and control network stop commands.
  - b. All safety devices shall stop the shuttle car immediately, with no abnormal noise, vibration, or brake overheating.
  - c. The safety devices test shall be conducted with the shuttle car fully loaded.

### 3. Weigh Test

- a. A container shall be loaded from empty to full capacity while on the shuttle car. Real-time monitoring of the weight, derived from the shuttle car weighing system, and sent via the wireless network to the display, shall be recorded.
- b. Weight values from the system shall be compared to actual weight of the full material to calculate accuracy.
- c. This test shall be conducted before and after the impact test.

### 4. Impact Test

- a. The shuttle car shall be impact-tested to simulate dropping five tons of material from 15 feet above the bottom of the container. The manufacturer shall provide and load a container into the shuttle car. This test shall be completed three (3) times, the load shall be dropped at the extreme right, left and center of the car.
- b. After each test the car shall be checked to verify that it does not derail. After the completion of the three-drop tests the structure of the car shall be visually inspected to verify no damage to the car has occurred. Impact absorbers such as sand bags can be used to prevent damage to the container.

### 5. Control System Failure Tests

- a. Provide a demonstration of system failure scenarios and the system's response to each failure including, but not limited to the following:
  - (1) Loss of Wireless Network
  - (2) Loss of PLC
  - (3) Loss of LAN

### 6. Operational Simulation Tests

- a. The Container Transport System shall be operationally tested. The test shall include the shuttle car, control panels, wireless network, computer control system, and all appurtenances required for a complete test.
- b. Shuttle car rails and three area stop points shall be provided, dimensionally equivalent to the project site, at the manufacturer's site.

- c. Operational testing shall simulate expected cycle frequencies and times during operation.
  - (1) A cycle is defined, for the purpose of this specification, as a complete round-trip of the shuttle car from the pier area to the lidding area, then to the loading area, back to the pier area.
  - (2) Under normal operation, the complete cycle is expected to take 15 minutes.
  - (3) Shuttle car movement between any two-area stop points shall not exceed 30 seconds.
- d. Testing shall be conducted with a fully loaded container in the shuttle car.
- e. Testing shall be conducted in two parts, with opportunity charging and without opportunity charging.
  - (1) With opportunity charging, the shuttle car shall run a complete cycle every 15 minutes for sixteen hours.
  - (2) Without opportunity charging, the shuttle car shall run a complete cycle every 15 minutes for sixteen hours. Recharge upon completion.
  - (3) Monitor and record battery condition throughout the test and recharge period.
  - (4) Inspect stopping accuracy at each area stop point throughout the test period.
  - (5) Monitor and record the charging system parameters throughout the test and recharge period.

C. Factory Tests Monitoring Requirements

- 1. This testing shall be in accordance with the requirements of Section 16080 – Electrical Testing Requirements, ASME B30.2 Section 2-2.2, and as specified herein.
- 2. The shuttle car manufacturer shall provide all personnel and equipment necessary to conduct the tests including, but not limited to shuttle car operators, trouble shooters, riggers, and rigging gear. Shuttle Car Shop Tests shall be in accordance with Section 01431 – Quality Assurance Inspection.

3. **Test Data:** Operating current measurements shall be recorded for electrical equipment using appropriate instrumentation. Speed measurements shall be recorded. Recorded values shall be compared with design specifications or manufacturer's recommended values; abnormal differences shall be explained in the remarks and submitted for approval or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected.
4. **Equipment Monitoring:** During the shop test, improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies shall be monitored. Observed defects critical to continue testing shall be reported immediately and testing shall be suspended until the deficiency is corrected. During and immediately following each test, the following inspections shall be made:
  - a. Inspect for evidence of bending, warping, permanent deformation, cracking, or malfunction of structural components.
  - b. Check for overheating in brake operation and for proper stopping.
  - c. Check for abnormal noise or vibration and overheating in machinery drive components.
  - d. Check electrical drive components for proper operation, freedom from chatter, noise, or overheating.

## 2.08 PREPARATION FOR SHIPMENT

- A. The shuttle car shall be disassembled only to the extent required for shipment to jobsite. All field connections shall be match marked, and a match mark drawing shall be furnished. Bolts for field connections shall be supplied, with each size separately packaged and identified, and keyed to the match mark drawings for each connection. A shuttle car erection drawing shall be furnished, showing the arrangement, weights, and assembly of all shipped assemblies and subassemblies to be installed on the completed shuttle car.

## 2.09 PHONE SUPPORT

- A. The shuttle car manufacturer shall provide free-of-charge telephone support to the DSNY during normal business hours, for one year from the date of Final Acceptance of the system, for warranty related issues.

## PART 3 EXECUTION

## 3.01 INSTALLATION OF CONTAINER TRANSPORT SYSTEM

- A. The shuttle car manufacturer shall provide detailed imbed requirements for locating any required limit switch tripper plates or targets. The manufacturer shall also provide the imbed requirements for the location of bumper stops furnished and installed by the Contactor.
- B. The Contractor under the direction of the field supervisor provided by the shuttle car manufacturer shall install the end of travel limit switch striker plates as well as the wall mounted battery charging system equipment.

## 3.02 FIELD QUALITY CONTROL

- A. Provide field-testing in accordance with Section 01811 – Preliminary and Final Field Tests.
- B. Preliminary Field Tests
  - 1. Preliminary Tests shall be performed to determine the Container Transport System meets the specifications, and can successfully show the following:
    - a. That each shuttle responds to commands from both the local control pendant and from the Lidding area control panels.
    - b. Stops quickly and accurately at each required stopping point.
    - c. Stops quickly when sensing an obstruction by the mechanical bumper system and the Laser detection system.
    - d. Warning lights and audible alarm operate as specified.
    - e. Battery charging system can fully charge the shuttle battery in not more than eight (8) hours.
    - f. Container load cells and display operate as specified.
    - g. Shuttle computer system is programmed to display and monitor system operation.
    - h. Wireless communication between shuttle cars, controls and computer system operate with no dead zones.

### C. Field Tests

1. Field Tests shall be conducted on the Container Transport System after Preliminary and Final Field Testing has been completed on the Gantry Crane. The Contractor shall perform Field Tests using a test container and lid placed in the Container Transport System. The container shall meet the requirements of Section 14512 – Containers.
  - a. The Gantry Crane shall be use to load the container car/s with an empty container first. The shuttles shall be moved from station stop to station stop.
  - b. The Gantry Crane will also place a container, which has been filled to weigh 30 tons on the shuttle car. This test container will be placed in the shuttle car to test the load cells and weight display. Only clean reusable material shall be placed in the container, such as sand or concrete blocks. With the loaded container, the Container Transport System shall be operated to demonstrate all system design functions as if in full processing operation.
  - c. The Contractor and manufacturer shall correct any defects found, and retest until the system is fully operational. Once fully operational, each bay shall repeat for 10 successive cycles without a malfunction. Testing shall be repeated until this can be achieved.
2. A Field Test shall be performed only after the installation and the Contractor has performed commissioning of the system. Once it has been proven that the supplied equipment meets the specified performance requirements and when all defects and faults found during commissioning have been corrected and upon completion of training, the system shall be accepted.
3. The equipment manufacturer and Contractor shall develop and submit for approval a Final Field Test Plan.

### 3.03 TRAINING

- A. The manufacturer shall provide two 8-hour days of training in accordance with Section 01821 – Training.

-END OF SECTION-

## Section 14512 CONTAINERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. This section covers and includes the furnishing of two (2) Intermodal Municipal Solid Waste (MSW) Containers per Marine Transfer Station. The containers shall be 20 foot long, by 8 foot 6 inches wide, by 12 foot high, 62 cubic yard Intermodal, watertight containers to be used for Field Testing by the Contractor. Following successful Field Tests, the containers shall be turned over to the City of New York for use at the Marine Transfer Station.
- B. The following specifications describe the containers to be provided for Field Testing the Gantry Cranes, Container Transport System and the Lidding Systems. The same containers as specified herein, shall be provided by separate Contract for processing waste after the MTS is in operation, and be used for rail, barge, or truck transport of solids.

#### 1.02 RELATED SPECIFICATIONS

- A. Section 01330 – Shop Drawings
- B. Section 09911 – Exterior Painting
- C. Section 14511 - Container Transport System
- D. Section 14601 – Container Lidding System
- E. Section 14640 – Container Gantry Crane

#### 1.03 REFERENCES

- A. Codes and Standards referred to in this Section are:
  - 1. (ABS) – American Bureau of Shipping
  - 2. (AAR) M930-98 - American Association of Railroads
  - 3. (ISO) – International Standards Organization
  - 4. (CSC) – International Convention for Safe Containers
  - 5. ASTM A588 – Standard Specification for High-Strength Low-Alloy Steel
  - 6. ASTM A36 – Standard Specification for Carbon Structural Steel

#### 1.04 GENERAL REQUIREMENTS

- A. The containers provided shall be suitable for use by rail, barge, or truck transport of solids.
- B. Sufficient documentation must be produced for each container to satisfy the requirements of the Quality Assurance Program and this specification.



- C. The Contractor shall comply with applicable Federal, State and Local Laws in the manufacture, testing, and shipment of the containers.

#### 1.05 DESIGN REQUIREMENTS

- A. The design is based upon solid waste container systems as manufactured by Wastequip Accurate and the terminology used herein may include reference to that manufacturer's proprietary product. Such reference shall be construed only as establishing the quality of materials and workmanship to be used under this section, and equivalent products of other manufacturers may be submitted for approval. The design shall be verified by an independent verification agency; such as The American Bureau of Shipping.
- B. The MSW containers specified herein are an Accurate Industries I-62/OT production unit design.

#### 1.06 SUBMITTALS

- A. Submit information and data to show experience in producing similar equipment, providing evidence including contact information for installations which the manufacturer has completed.
- B. Submit a complete written description of the container in sufficient detail to permit comparison with the technical specification herein.
- C. The Contractor shall submit complete working drawings, including complete dimensional information and materials list. Information submitted shall be in accordance with Section 01330 – Shop Drawings.

#### 1.07 QUALITY ASSURANCE

- A. The container manufacturer shall show evidence of a Quality Assurance Program. The container manufacturer must have three (3) years of experience building intermodal containers of a similar size and design for transport of Municipal Solid Waste. No prototypes will be accepted.
- B. The manufacturer shall have field proven performance in design and manufacturing similar type intermodal waste containers.
- C. The manufacturer must have the capabilities in house of performing the AAR, AAR Marine and CSC Prototype Tests. Prototype Testing shall be supervised and certified by an independent agency, such as The American Bureau of Shipping (ABS). An ABS Prototype Test Certificate shall be provided to the DSNY.
- D. Production must be inspected at each stage of manufacture by an independent verification agency, such as ABS, who shall issue a "Cargo Container Production Certificate" to the owner upon the completion of this job.

- E. Production Testing shall be as described in Article 2.03 of this specification.

## 1.08 WARRANTY

- A. The Warranty shall be in conformance with Article 24 – Maintenance and Guaranty of the Standard Construction Contract.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide containers of one of the following manufacturers:
  - 1. Wastequip Accurate
  - 2. McLain Industries
  - 3. Or approved equal

### 2.02 CONTAINER SYSTEM AND COMPONENTS

- A. Containers shall meet the current applicable requirements of the American Association of Railroads, AAR M930-98 / ABS Rules, AAR Marine, and CSC, and be certified by an independent agency such as the American Bureau of Shipping.
- B. The containers shall be 62 cubic yard net inside capacity. The outside dimensions shall meet the AAR tolerances on length, width, and diagonal measurements for a nominal 20-foot long x 8 foot 6 inch wide AAR container. Height shall be 12 foot maximum.
- C. The containers shall be fitted with eight (8) ISO corner castings and shall be located to meet AAR and CSC standards. There shall be no protrusion of any kind, including hardware, doors lids, etc., past the outer envelope of the corner castings.
- D. Documentation of materials will conform to "Material Identification" form submitted and approved by ABS. Structural steel tubing shall be ASTM A588, minimum. Full length, no splits or joints. Steel 7 Ga. and lighter shall be ASTM A588, minimum. Hinged plate and flapper plate steel 1 inch and heavier shall be ASTM A-36, minimum. Round bars shall be ASTM A-36, minimum. Detailed specifications are minimum only, heavier and / or stronger specifications are acceptable.
- E. Floor shall be 7 Ga. steel, and shall have 5 ½ inch formed 10 Ga. steel channel cross-members on approximately 16 inch spacing. Side sills shall be a minimum of 3 inch x 8 inches x 11 Ga. structural tubing. Floor joints shall be located over a cross-member and spaced so a weld can be applied to joint and cross-member and full seam welded to assure structural integrity and watertight capabilities.

- F. Non-laden fork pockets shall be installed in floor to meet AAR design requirements; 81 inch centers, 14-inch wide minimum, 4½-inch high minimum. Fork pockets for empty container use only.
- G. Sides shall be 12 Ga. steel. Structural side supports shall be 11 Ga. steel, 2¾-inch deep minimum. Side supports shall be full welded to side sheets. Bottom of sidewall and bottom of formed tubes are full welded to floor and bottom rail on outside and inside. Top horizontal structural welded tubing shall be 8 inch x 4-inch x ¼ inch minimum. Side sheet shall be full welded to top tube on outside and stitch welded on the inside. Sidewall shall be designed to withstand the stresses developed during the loading and discharge of the container.
- H. The eight (8) corners shall have vertical structural welded tubing, between and supporting, the top and bottom corner castings. These tubes shall be designed structurally to meet the AAR M930-98 / ABS Rules / CSC requirements for stacking loaded containers with a gross weight of 35 tons gross load, during barge haul operations.
- I. As an important safety item the operator must be able to open the door from the side of the container allowing him to be clear of the door and the load when the lock is released.
- J. Liquids present in the loads to be hauled are considered to be a Contaminated Waste. Therefore, it is imperative to have a proven watertight seal system in addition to the CSC weatherproof seal. A proven design of a neoprene gasket sealed with a "knife edge" shall be provided between the door and door-jamb mating face to guarantee a watertight seal, so that no liquids from the waste material can leak out of the containers. The gasket shall be made of durable material and easily replaceable. The Manufacturer shall provide design details, sample and evidence of successful field usage. No prototype designs are acceptable. The gasket and seal design shall be approved by the Engineer before fabrication, and be of the "knife edge" design to ensure a positive seal. Compression gaskets will not be accepted.
- K. The door shall have two (2) horizontal and two (2) vertical ¼ inch steel plate formed channel frames, plus two (2) 7Ga. steel vertical members. The door shall be 11Ga. steel. Four (4) hinges shall be installed on top of door so door opens at bottom. Hinge pins shall be stainless steel. Interior and exterior of door shall be full welded.
- L. A neoprene gasket shall be provided on the doorjamb mating face to guarantee a watertight seal. Gasket shall be 1-inch x 1-1/2 inch and shall be made of 30 to 45 durometer solid neoprene, and be easily replaceable. Gasket shall be of knife-edge design.
- M. The end door is to be locked into place by four ratchet binders for watertight security; one on each side with a "V" chain to the door, and one on each side at the floor to operate a bottom flapper system. This system must have field proven

durability in previous container operations and shall consist of a full width bar between the bottom castings and four (4) one inch thick flappers that press on the bottom of the door. Ratchet binders shall be 1-inch x 10-inch. Chain shall be G-70 transport chain. Each individual chain assembly shall be pull tested to a minimum of 13,200 lbs.

- N. The bulkhead shall be 11 Ga. sheet steel and shall have two (2) vertical members, welded to bulkhead sheet. Top horizontal tube shall be 6-inch x 4-inch x 3/16-inch structural tube minimum. Bulkhead shall be fully welded.

## 2.03 PRODUCTION TESTING

- A. Internal Water Test: The containers shall be watertight welded and tested in accordance with the following. Every container shall be fully welded on all joints and seams on the inside. A Water Test Certificate shall be provided for each container stating the internal test procedure and signed by the Quality Control Inspector. The procedure is to fill the containers to 24-inches and let stand for 30 minutes and inspect for no leaks. Repair if leaks are found and retest. Continue retesting until watertight.
- B. Vertical Lifting from the Top at Three (3) Times Rated Capacity: Each container shall be tested and certified by the manufacturer that every top and bottom corner casting has been tested to three (3) times the rated capacity. The procedures shall be –pull assembly to three (3) times capability and hold for five (5) minutes while visually inspecting welds.

## 2.04 PREPARATION, BLASTING & PAINTING

- A. Painting shall be performed in accordance with Section 09911 – Exterior Painting and as modified below.
- B. Containers shall be scraped and ground to remove sharp edges. The complete exterior and interior surfaces shall be cleaned.
- C. Containers shall be shot blasted or sand blasted on four (4) exterior sides to SSPC-SP7 standards.
- D. Exterior – Shall be primed with 1 coat, 5 mils, series N69 Epoxoline (polyamidoamine Epoxy), VOC-2.11 or equal. The topcoat shall be Polyamideoamne Epoxy Primer with Polyamidoamine Epoxy of Aliphatic Acrylic Polyurethane Enamel Finish Coats or equal. Interior shall be 2 coats of Coal Tar Epoxy or equal.
- E. Paint color shall be determined by the DSNY.
- F. Caulking shall be gray Silkaflex No. 221, or equal.

## 2.05 LABELING

- A. Numbering system: Letters and numerical decals 6-inches high to meet AAR Requirements shall be furnished and installed by the container manufacturer on all four (4) sides. Number sequence to be provided by the manufacturer.
- B. AAR Plate shall be furnished and installed by the container manufacturer.
- C. CSC Plate shall be furnished and installed by the container manufacturer.
- D. ABS Decal shall be furnished and installed by the container manufacturer.
- E. DSNY decals shall be provided by the City of New York and installed by the manufacturer.
- F. No placard holders or paperwork holders or other mounting brackets shall be installed.

## 2.06 CONTAINER LID AND VENT

- A. The container lid shall be designed using 12 Ga. steel with a formed steel perimeter with internal tubing structure (11 Ga.), and fully welded for water tightness.
- B. The lid shall be fabricated from corrosion resistant high tensile steel meeting the requirements of ASTM A588.
- C. The container lid shall be fully gasketed, with a 30 to 45 durometer solid Neoprene Gasket.
- D. The container lid shall be designed to work in conjunction with the mechanism described herein, and as specified in Section 14601 – Container Lidding System.
- E. The lid shall not hinder the operation of the rear door.
- F. Four (4) Twist Locks per Wastequip Accurate Industries patented design shall hold down the container lid.
- G. The lid shall also have the provision to be lifted via magnet, spreader or forklift.
- H. The vent shall be closed to the outside while automatically allowing air into the container during dumping.

2.07 DOCUMENTATION

- A. The manufacturer shall submit Production Certification report meeting AAR M930-98, ABS rules, CSC and AAR Marine. This report includes the ABS provided "PRODUCTION CERTIFICATE".

PART 3 EXECUTION (Not Used)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 14601**  
**CONTAINER LIDDING SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Container Lidding System shall be complete with an electric hoist, electric spreader, control panels, and all other controls, connections, and appurtenances as shown, specified and as required for a complete installation. Equipment described in this section shall be designed for heavy use in material handling marine applications.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 01431 - Quality Assurance Inspection
- C. Section 01750 - Spare Parts and Maintenance Materials
- D. Section 01811 - Preliminary and Final Field Tests
- E. Section 01821 - Training
- F. Section 01831 - Operation and Maintenance Manuals
- G. Section 09911 - Exterior Painting
- H. Section 14511 - Container Transport System
- I. Section 14512 - Containers
- J. Section 14640 - Container Gantry Crane
- K. Section 16220 - Electric Motors
- L. Section 17320 - SCADA System - Control Panels and Enclosures
- M. Section 17330 - SCADA System - Panel-Mounted Instruments and Devices

**1.03 GENERAL REQUIREMENTS**

- A. The Contractor shall furnish the necessary labor, materials, equipment and incidentals required to provide a complete and functioning system.
- B. The system manufacturer shall be a company specializing in manufacturing and installing container lifting systems with not less than three (3) years successful experience.
- C. All fabricated materials shall conform to the tolerances specified in the AISC manual and ASTM A6, Holes and other provisions for field connections shall be accurate and shop checked so that proper fit will be provided when the units are assembled in the field.



#### 1.04 DESIGN REQUIREMENTS

- A. The key requirements which shall be incorporated into the design and manufacture of the Lidding Equipment are:
1. The mounting of the electric hoist assembly shall be by bolting the hoist frame to the top flange of the supporting I-beams. Each Container Lidding Station incorporates two supporting I-beams mounted to the structure above the Lidding Area.
  2. Provide safe, stable lifting of the container lids without tipping, dropping or damage.
  3. Provide capability for operations with short cycles with high reliability using an electric operating system.
  4. Allow Lidding Operator safe control of the hoist and spreader mechanism.
  5. Incorporate safety in all applicable operating aspects.
  6. Ease of maintenance.
  7. Compatibility with the containers lid locking system.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Each lidding system shall be designed to accurately attach the spreader to the container lid, hold the lid securely, unlock it from the container, lift, hold, suspended and return to the container the steel container lid it has removed, and lock it again. Containers will be 8.5 ft. wide, 20 ft. long, 12 ft. high (nominal). The containers provided will be designed for heavy-duty municipal solid waste (MSW) handling service. The lidding system shall be compatible with the container lid and locking system is a patented system by Wastequip Accurate, which is the system proposed by this design. The container manufacturer will specify and provide the exact dimensions of the lid and locking assembly locations. The weight of the lid shall be approximately 1200 lbs.

#### 1.06 SUBMITTALS

- A. Submit information and data to show experience in producing similar equipment, providing evidence including contact information for at least 3 installations for which the manufacturer has completed.
- B. Submit a complete written description of the container lidding system in sufficient detail to permit comparison with the technical specifications herein.
- C. Submit wiring diagrams for all electric equipment. Use manufacturer's standards.

- D. Submit and clearly note any deviations from the Contract Drawings or specifications herein.
- E. Submit complete working drawings, including complete dimensional information, catalog cuts of component parts and materials list, showing the location of all equipment and control devices, and all other information necessary to render totally functional system to the owner. Information submitted shall be in accordance with Section 01330 – Shop Drawings.
- F. Provide Operation and Maintenance manuals in accordance with Section 01831 - Operation and Maintenance Manuals.

#### 1.07 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Section 01431 - Quality Assurance Inspection.
- B. The lidding hoist and spreader shall be tested to show compliance with the requirements of this specification. A witnessed factory test shall be performed to show the following:
  - 1. Ability to match the twist lock spacing pattern of the proposed container lid.
  - 2. Ability to lock/unlock the containers four twist locks both in automatic and manual modes.
  - 3. Show the operation of the eight indicating LED lights both successfully operating, and in various failure modes.
  - 4. Show the operation of control panels to perform as specified.
  - 5. Show that the hoist and spreader can center itself over the container using the fixed guides.
  - 6. Show ability to prevent lid from accidentally being released from the spreader when removed from the container.
  - 7. Demonstrate that when the hoist is placed in the maintenance mode/position, the spreader can be lowered to the Pier Level floor below for maintenance or repair.
  - 8. Demonstrate that when the spreader is locked on to a container lid and lifted away from the container, the lid cannot be released accidentally.

## 1.08 SPECIAL TOOLS AND SPARE PARTS

- A. The Contractor shall obtain from the equipment manufacturer and submit for approval the following spare parts lists in accordance with Section 01750 - Spare Parts and Maintenance Materials.
1. A complete list of parts and supplies with current unit prices and source of supply.
  2. A list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified herein to be furnished as part of the Contract.
  3. A list of additional items recommended by the manufacturer to assure efficient operation at the particular installation. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. A separate number shall properly identify each part. Those parts, which are identical for more than one size, shall have the same parts number.
  4. The following minimum spare parts shall be provided with the equipment, and be packaged separately for each of the two stations:
    - a. One year's supply of lubricants necessary to maintain all supplied units.
    - b. One hoist motor assembly
    - c. Eight linear actuator assemblies for the spreader
    - d. Eight spreader twist-loc pins
    - e. Two (2) LED lamps of each color
    - f. Sufficient wire rope lifting cable to completely replace cable on each unit one time
    - g. Any additional spare parts recommended by the manufacturer
    - h. The manufacturer shall furnish one set of all special tools required to disassemble, service, repair, and adjust the container lidding system. Tools shall be provided in a lockable metal toolbox.

## PART 2 GENERAL

## 2.01 MANUFACTURERS

## A. Acceptable Hoist Manufacturers

1. Sissco Material Handling Equipment, Hillsborough, NJ
2. Yale Hoist, Muskegon, MI
3. Acco, York, PA
4. Chester Hoist, Lisbon, OH
5. Or approved equal

## B. Acceptable Spreader Manufacturer:

1. Greenfield Products, Markham, IL
2. Or approved equal

## 2.02 CONTAINER LIDDING SYSTEM AND COMPONENTS

## A. Hoist

1. A framed hoist assembly shall be provided and mounted (bolted) to the supporting I-beams.
2. The hoist assembly shall consist of four drums with independent payouts sized with a total travel of 30 feet.
3. The hoist shall be deck mounted, worm drive with four lifting hooks and a single electric motor.
4. The hoist shall lift the container lid 3 feet above the container and hold it there until the container is returned for relidding.
5. The hoist shall be designed and furnished in accordance with ASME HST-4-1999, Performance Standard for Overhead Electric Wire Rope Hoists, and as specified in this section.
6. All motors shall be variable frequency, squirrel cage, high starting torque, totally enclosed type, reversible, wound for 480 volts, 60 hertz, 3 phase service. Motors shall have time ratings in accordance with ASME HST-4-1999, and a temperature rise of 105oC maximum, above 40oC ambient with NEMA Class F insulation.
7. Hoist shall be designed for service in a wet environment protected from direct weather exposure.
8. Capacity of the hoist shall not be less than 5 tons.

9. The hook pattern for the hoist should be oriented to attach to each lifting hook on spreader.
10. Hoist Classification: Normal industrial service, HMI Class H3.
11. Hoist shall be designed to raise and lower at a speed of 30 feet per minute.
12. Hoist motor shall be at least 15 horsepower. Motor speed shall be 1800 RPM. Motor type shall be TENV, with Class F insulation high slip, high torque, suitable for variable frequency control.
13. The hoisting mechanisms shall be of worm gear reduction type, and all gearing shall be provided with adequate means of lubrication. Lowering shall be only by means of continuous application of power to the hoist motor. The hoist shall be provided with one holding brake consisting of an automatic electric brake capable of stopping the rated load of the hoist while in motion. The hoist shall be provided with an upper and lower geared limit switch to stop the hoist as shown in the highest and lowest preset operating position in addition to a final upper block operated limit switch. Motors, starters and transformers shall be furnished and mounted on the hoist frame.
14. The drum shall be fabricated from steel tubing and grooved to guard against the rope jumping out of the groove. The drum shall be sized for the wire rope to be in a single wrap in the high hook position and for two wraps remaining with the hook in the low Pier Deck position.
15. The lifting tackle shall consist of a safety type lower block and hooks with necessary sheaves and wire rope. The hooks shall be forged steel. The wire rope lifting cable shall be of flexible steel. Lifting cable shall be of sufficient length for the hook to reach lowest lifting point at pier level for servicing the spreader.
16. The hoist shall be provided with grating covering the top of the assembly for servicing the equipment by maintenance personnel. Grating shall be locked in place with suitable fasteners to prevent movement. Grating shall allow access to all component parts.
17. OSHA type handrail shall be provided around the top of the assembly on three sides, and be open to side facing service walkway as shown.
18. Power
  - a. Electric Power: Electric power available for hoist operation shall be a single 480 V, 60 Hz, 3-phase service. Provide motor starters in NEMA 4X stainless steel enclosures mounted to the equipment. Provide a transformer in a NEMA 4X stainless steel enclosure to provide 24Vdc power for control circuits to the spreader. Provide branch circuit fuses

for all motors and control circuits. All wiring and equipment shall conform to the applicable provisions of the National Electrical Code.

- b. Motors shall be suitable for hoist service. Motors shall be rated on not less than 30-minute basis with temperature rise in accordance with NEMA standards.
- c. Provide a heavy-duty cable reel system to feed control/power cable to the spreader. The cable reel shall be spring payout and return type, and be fabricated from stainless steel. The lidding system manufacturer shall determine the minimum number of conductors and AWG cable size and overall length of the cable/s feeding the spreader system. Cable/s attached to the spreader shall have a quick disconnect connection. The cable/s shall be of sufficient length to reach the pier deck in the event the operator fails to disconnect it from the spreader. The cable reel system shall be as manufactured by Aeromotive, Gleason Reel, Hannay Reels Inc., Nordic Systems Corporation, or approved equal.
- d. Cable reel system shall include the following features:
  - (1) Spring motors shall be linked so that the reel will continue to function should one spring break. Springs shall have broken spring indicators.
  - (2) Gear enclosures shall be water and dust tight.
  - (3) Cable guides shall be provided to direct cable onto the spool for even wrap.
  - (4) Slip rings and slip ring enclosure shall be easily removable. Slip rings shall be provided with as many conductors necessary and required to operate the spreader.
  - (5) Slip rings shall be suitable for 35 to 200 AMPS, or as recommended by the lidding equipment manufacturer.
  - (6) The reel shall be provided with a positive, extra heavy spool lock to prevent spool freewheeling during maintenance to the reel or cable.
  - (7) Junction boxes shall be oversized to allow ease of wiring.
  - (8) Gear drives shall be heavy-duty and include a detensioning device for de-energizing spring during cable replacement or other maintenance.

- e. The cable reel and cable shall be designed that under normal lidding and de-lidding operation (raising and lowering a container lid), the cable/s will have sufficient slack to raise and lower the spreader approximately three (3) feet without having to pay out cable from the cable reel. A stop ball on the cable/s shall be provided for this purpose.
- f. Control/ Power cables to the spreader shall be supplied with strain relief cable grips at quick-disconnect points on the spreader. Cable grips shall be as manufactured by Amtec Corporation, Appleton Electric, Woodhead Industries, Inc. or approved equal.

#### 19. Controls

- a. All hoist controls shall be 120 volts, 60 hertz single phase. The hoist shall be controlled from both a remote wall-mounted control panel, and a railing mounted push-button control having the same function as the wall-mounted control. Panels shall be located as shown on the Contract Drawings. Panels shall meet the requirements of Section 17320 – SCADA System – Control Panels and Enclosures, and Section 17330 – SCADA System – Panel-Mounted Instruments and Devices.
- b. Lidding Hoist Wall-Mounted Control Panel
  - (1) Push buttons for each of the following operations:
    - (a) Up push button
    - (b) Down push button
    - (c) Power on indicating light.
    - (d) Two-position selector switch. In the "Operate" mode the operator controls the system with safety interlocks in control. In the "Maintenance" position interlocks are overridden and the spreader can be lowered to the pier deck for maintenance, or raised above the normal operating height.
  - (2) Lidding Hoist Railing-Mounted Control Panel
    - (a) Up push button
    - (b) Down push button
    - (c) Power on indicating light
- c. The control unit for the hoist motion shall consist of a variable frequency drive controller, overload and under voltage protection. Overload protection shall be the automatic reset type. A main line

magnetic contactor shall be included as an emergency stop safety feature. All control equipment shall be housed in NEMA 4X stainless steel enclosures.

- d. Hoist Overload Cut-Off Device: Provide overload device designed to interrupt the lifting circuit of the hoist, without affecting the lowering circuit, when the load exceeds the hoist capacity. This interlock operates in either the "Operate" or "Maintenance" mode.
- e. Control enclosures and motors shall be provided with a 120-volt space heater.
- f. Provide fused motor and control circuits.

**B. Lidding Spreader**

- 1. The twist lock spacing pattern shall match that of the container lid. This shall be coordinated with the -City of New York after equipment selection.
- 2. Overall length and width of the spreader shall not be greater than that shown on contract drawings.
- 3. The locking mechanism of the spreader shall be capable of unlocking/locking and lifting a lid at four fixed locations on the container lid through multiple mechanisms. The locking mechanism shall be electrically actuated. Item 'b' below, shall be considered a backup system to item 'a', which shall be the primary operating system. Both systems shall be built into the design of the spreader. The spreader manufacturer shall coordinate both systems with the approved container manufacturer.
  - a. An automatic system coordinated with the container manufacturer to provide for compatibility of the container lid castings with the lid holding mechanism.
  - b. A manual system shall be provided where the spreader can lift and hold a lid through the use of manual quarter turn lever or handle at each attachment point.
- 4. The spreader assembly shall be constructed of steel, and meet ISO standards.
- 5. Removable fixed guide arms shall be provided on four sides to position the spreader onto the container and align it with the locking mechanism on the lid as shown.
- 6. Grab handles shall be provided at the corners of the spreader for manual positioning of the spreader onto the lid as shown.



7. Four lifting eyes or other means shall be provided to allow for raising and lowering of the spreader assembly by the hoist assembly.
8. Eight indicating lights shall be mounted on the spreader assembly as shown to signal the operators on the platform when the latching/locking mechanism is engaged, released, or malfunctioned.
9. Controls
  - a. The lidding operator shall direct and control the lidding system from the lidding area work platforms.
  - b. A wall-mounted control panel shall be provided for each lidding position, located on the inbound side of the lidding area as shown.
  - c. The panel shall control the spreader mechanism.
  - d. Provide a lowering interrupt signal to the electric hoist to shut down the hoist motor when all spreader twist locks are seated. This will prevent paying out additional cable unnecessarily.
  - e. Provide a lift interrupt signal to the electric hoist to keep the hoist from lifting the spreader before the twist locks are in "locked" position.
  - f. The spreader control panel shall meet the requirements of Section 17320 – SCADA System – Control Panels and Enclosures, and Section 17330 – SCADA System – Panel-Mounted Instruments and Devices, and shall include the following controls:
    - (1) Locking of lid onto spreader/unlocking lid from container.
    - (2) Unlocking of lid from spreader/locking of lid onto container.
  - g. Each of the spreaders shall be equipped with two (2) LED light bar assemblies, each consisting of four (4) LED lights. Each assembly shall be located as shown, and shall consist of the following:
    - (1) Two (2) yellow LED indicating lights, each interlocked with a corner twist-loc. The light shall energize when the spreader locking system is fully seated and positioned on the corresponding twist lock latch on the container lid.
    - (2) One (1) red LED indicating light shall be provided. The light shall energize when all four of the spreader twist lock latches are not locked to the lid.

(3) One (1) green LED indicating light shall be provided. The light shall energize when all four (4) twist lock latches are locked to the lid.

h. The manufacturer shall design into the system the means of preventing the lid being accidentally released from the spreader when removed from the container. Pressure on the lid by the spreader against the container shall be required in order for the lock/unlock push buttons to operate.

## 2.03 PAINTING OF EQUIPMENT

- A. Painting shall be performed in accordance with Section 09911 - Exterior Painting and as modified below.
- B. The container lidding equipment shall be painted using a three-coat system, which consists of an inorganic zinc primer with epoxy intermediate and polyurethane finish.
- C. Metal surfaces shall be cleaned with finishes applied over SSPC-SP10 sandblast cleaning.
- D. The prime coat shall be Carboline Carbo Zinc 11, an inorganic zinc primer or approved equal. The primer shall be applied at a minimum coating thickness of 2-3 mils on flat surfaces. Note that some surfaces in corners and open structure may require excess spot thickness to achieve a proper coating.
- E. The intermediate coat shall be Carboline 890 Epoxy or approved equal hi-build epoxy, which offers oil, acid, and salt resistance, and mechanical strength. Dry film thickness shall be not less than 5 -7 mils.
- F. The finish coat shall be Carbothane 134HS or approved equal acrylic aliphatic polyurethane, which offers high gloss retention, oil, acid, and salt resistance, mechanical strength, and long life under a wide range of conditions. Dry film thickness shall not be less than 2 mils.
- G. Purchased equipment such as motors, brakes, etc. shall be left with the manufacturer's standard finish, which shall be specified for a marine environment.

## PART 3 GENERAL

### 3.01 FIELD QUALITY CONTROL

- A. Provide field-testing in accordance with Section 01811 - Preliminary and Final field tests.

- B. Preliminary Tests shall be performed to determine the lidding system meets the specifications, and can successfully show the following:
1. Hoist has the ability to raise and lower the spreader within operating parameters utilizing interlocks and set limits of operation.
  2. Hoist cables pay out evenly and the spreader is level.
  3. In "Maintenance" position, the hoist can lower the spreader to the Pier Level floor, and raise the spreader above set operating limits.
  4. Demonstrate all push buttons, lights and controls operate on each control panel.
  5. Spreader lights function as specified.
  6. Spreader controls operate as designed.
  7. Power cord reel pays out and rewinds power cord without binding or undue sag repeatedly.
- C. A Final Field Test shall be performed only after the installation and the contractor has performed commissioning of the system. Once it has been proven that the supplied equipment meets the specified performance requirements and when all defects and faults found during commissioning have been made good or otherwise agreed upon in writing; and upon completion of training, the system shall be deemed to have been accepted.
- D. Final Field Tests shall be conducted on the lidding system after Preliminary and Final Field Testing has been completed on the Gantry Crane and Container Transport System. Per Section 14512 – Containers, the Contractor shall perform Final Field Tests using a test container and lid placed in the Container Transport System. The Gantry Crane shall be used to load the container car/s with and empty container. The container car/s shall move the container into each Lidding Bay. At this point the lidding system shall be operated to demonstrate all system design functions as if in full processing operation. The contractor and equipment supplier shall correct any defects found, and retest until the system is fully operational. Once fully operational, each bay will repeat for 10 successive cycles without a malfunction. Testing shall be repeated until this can be achieved.
- E. The equipment manufacturer and contractor shall develop and submit for approval a Field Test Plan.

### 3.02 TRAINING

- A. The manufacturer shall provide two 8-hour days of training in accordance with Section 01821 – Training.

-END OF SECTION-

**Section 14630**  
**MAINTENANCE BAY BRIDGE CRANE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements for design, manufacturing, installation and testing of an electric-powered, rail-mounted, top running single girder crane for operation in the maintenance bay. The maintenance crane shall be designed in accordance with The Crane Manufacturers Association of America # 70, Class C, Moderate Industrial Service, and as described herein.

**1.02 RELATED SECTIONS**

- A. General Conditions, Article 13 – General Electrical and Mechanical Requirements
- B. Section 01330 - Shop Drawings
- C. Section 01431 - Quality Assurance Inspection
- D. Section 01732 - Installation of Equipment
- E. Section 01750 - Spare Parts and Maintenance Manuals
- F. Section 01811 - Preliminary and Final Field Tests
- G. Section 01831 - Operation and Maintenance Manuals
- H. Section 05081 - Galvanizing
- I. Section 09912 - Interior Painting
- J. Section 16055 - Electrical Requirements for Shop-Assembled Equipment
- K. Section 16220 - Electric Motors

**1.03 REFERENCES**

- A. Codes and standards referred to in this section are:
1. AISC - American Institute of Steel Construction
2. AGMA - American Gear Manufacturers Association
3. ASME B30.2 - Overhead Gantry Cranes(Top Running Bridge, Single or Multiple Girders, Top Running Trolley Hoist)
4. ASME B30.16 - Overhead Hoists (Underhung)
5. ASME B30.17 - Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
6. ASME-HST-4M - Performance Standard for Overhead Electric Wire Rope Hoists.

7. CMAA Spec No. 70 - Specification for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes
8. CMAA Spec No. 74 - Specification for Top Running and Under Running Types of Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist
9. HMI - 100 - Hoist Manufacturers Institute
10. New York City Building Code
11. NEC - National Electrical Code
12. NEMA - National Electrical Manufacturers Association

#### 1.04 SYSTEM DESCRIPTION

- A. Type: The crane shall be a 5-ton, top running, single girder, pendant-controlled, overhead traveling bridge crane system with motor-operated bridge, motor-operated under hung trolley operating on the bottom flange of the bridge girder, and motor-operated wire rope hoist, located in the maintenance bay of the transfer station.
- B. Performance Requirements: Provide bridge crane equipment meeting the following performance requirements:

- |   |           |
|---|-----------|
| 1. Capacity, tons   | 5         |
| 2. Span center-to-center of crane rails   | 24'-0"    |
| 3. Elev. of top of crane rails  | El. 52.00 |
| 4. Elev. of highest point of equipment - not higher than  | El. 54.00 |
| 5. Elev. of hook in highest position - not lower than   | El. 47.50 |
| 6. Elev. of hook in lowest position - not higher than   | El. 27.50 |
| 7. Elev. of operating floor   | El. 27.00 |
| 8. Bridge travel speed ft/min. (approx.)  | 75        |
| 9. Trolley travel speed ft/min (approx.)  | 45        |
| 10. Trolley horsepower  | 1/2       |
| 11. Hoisting speed ft/min (max.)  | 30        |
| 12. Hoist Horsepower  | 7.5       |
| 13. Min. end clearance - bridge travel - hook to crane stop - not more than                             | 3'-6"     |
| 14. Min. distance at outside wall - trolley travel - hook to centerline of crane girder - not more than | 3'-6"     |
| 15. Min. distance at inside wall - trolley travel - hook to centerline of crane girder - not more than  | 2'-2"     |

- |  |               |
|--|---------------|
| 16. Bridge truck projection - beyond crane rail -<br>not more than | 8"            |
| 17. Size of crane runway rails                                     | 40# ASCE Rail |

#### 1.05 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Submit catalog data and information for each unit.
- C. Shop Drawings: Submit shop drawings, including arrangement and erection drawings of the equipment and control equipment, templates, schematic control diagrams, electrical connection diagrams, and complete description of the control system. Information submitted shall be in accordance with Section 01330 – Shop Drawings.
- D. Quality Control: Submit the following documents:
  - 1. Manufacturer's certified performance and materials records
  - 2. Manufacturer's certified copies of Field Test Reports
- E. Operation and Maintenance Manuals: Submit Operation and Maintenance (O&M) instructions for the bridge crane. Operation and Maintenance (O&M) instructions shall be in accordance with Section 01831 – Operation and Maintenance Manuals.

#### 1.06 QUALITY ASSURANCE

- A. Qualifications: Provide completely assembled bridge crane of standard manufacture made by a company which has had equipment of equivalent capacity and design giving satisfactory service in similar installations, and which can furnish replacement parts which are completely interchangeable within the original hoist assembly.
- B. The crane manufacturer shall submit a certificate of compliance for the crane stating that design and fabrication of the crane is in accordance with the following applicable standards and specifications.
  - 1. ASME Safety Standards B30.16 and B30.17.
  - 2. Crane Manufacturers Association, Inc.
    - a. CMAA Specification No. 70, for top running bridge and gantry type multiple girder electric overhead traveling cranes
    - b. CMAA Specification No. 74 for top running and under running single girder electric overhead traveling cranes

3. ASME/HST Hoist Performance Standard: ASME HST-4M for electric wire rope hoists

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 and as follows:

1. Protect all electric equipment from the weather during transit and storage by suitable means, including shrink wrapping or hand wrapping and taping.

#### 1.08 SPARE PARTS

- A. The Contractor shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in Section 01750 – Spare Parts and Maintenance Materials.

- B. The following minimum spare parts shall be provided with the equipment:

1. One set of bridge truck bearing assemblies
2. One set of trolley bearing assemblies
3. One contactor assembly of each type
4. One push button assembly for pendant push button control station
5. One year supply of lubricants

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Ederer - Seattle, WA
2. Harrington Hoists - Manheim, PA
3. Shepard Niles, Inc. - Montour Falls, NY
4. Yale Lift-Tech - Muskegon, MI

#### 2.02 MATERIALS

- A. General: Design structural components in accordance with AISC standards. Design all load bearing parts with a safety factor of at least five at rated capacity loads, based on the ultimate strength of the materials used. Arrange bridge crane to operate within the space shown with adequate clearances, with minimum clearance to the nearest obstruction not less than 3 inches vertical and 2 inches horizontal.

1. Arrange all working parts for convenient inspection, lubrication, adjustment, repair, or replacement. Assemble, paint, test, and adjust the equipment in the shop as far as practicable before shipment.
  2. Suitably house the operating machinery and other exposed parts; fabricate the exterior of the unit to have smooth surfaces of pleasing appearance.
  3. Design the hoist with an overload limit device to prevent damage to the equipment or structure if loads in excess of the specified capacity of the hoist are applied.
  4. Place an inscription, easily readable from the operating floor, on the bridge crane showing the rated capacity of the equipment and control identification. Provide all appurtenances, caution markers, and appliances necessary to comply with applicable safety laws and codes.
  5. Unless otherwise specified, provide all hoisting equipment suitable for normal indoor service, as shown, designed for the following service classification:
    - a. Top running single girder electric overhead traveling crane is Moderate Industrial Service Classification of CMAA Spec. No. 74.
    - b. Motorized hoist Class H-3 of Hoist Manufacturers Institute HMI-100.
- B. Crane Bridge: Provide cranes bridge of single girder type and top running as specified.
1. Single Girder: Fabricate bridge of a single girder of suitable size and section properly braced to withstand all strains of loading and impact during operation. Where necessary, provide an auxiliary girder to support over-hanging loads to prevent detrimental torsional and lateral deflections.
  2. Design Loads: The combination of loads to be used in design is the sum of the maximum stresses due to dead load, trolley weight, rated load and impact. Include an impact allowance of 15 percent of the rated load. Design girder so that maximum stresses produced in the lower flange do not exceed  $1/5$  of the ultimate strength of the material, while the stresses in the top flange are limited to the crippling formula employed for compression members and by lateral strains due to starting and stopping of the bridge suddenly when fully loaded. Provide girder whose maximum vertical deflection under full load does not exceed 0.00125-inch per inch of span. Do not consider impact in determining this deflection.
  3. Alignment: Rigidly connect girder with the end trucks and provide connections in both vertical and horizontal planes and of such design and construction as to keep the entire bridge structure square and in alignment under all operating conditions.



4. Bridge and Trolley Stops: Bridge stops shall be furnished and installed by the Contractor in accordance with the design shown on the structural drawings. Equip trolley with suitable and adequate stops. Provide stops which do not engage the tread of the wheel, designed in accordance with CMAA Spec. No. 74, Subsection 4.8.
5. Bridge Trucks: Provide bridge trucks of structural steel construction with bracing, stiffeners or diaphragms, jig welded and designed to provide true alignment of wheels, axles and drive shafts. Securely attach the bridge trucks to the bridge girder with turned bolts, with all holes drilled and reamed to match fit up before final assembly and welding.
6. Wheels: Provide substantial rail sweeps in front of each outside wheel which project below the top of the runway rail. Manufacture bridge trucks with ball or roller bearings and fixed or rotating type steel axles. Provide axles of medium or high carbon steel or high strength alloy steel, as required. Make provision for easy removal of wheels and axles. Machine the entire truck as a unit to provide proper alignment.
  - a. Provide bridge truck wheels of double flanged, rolled, forged or cast steel with hardened treads, designed to carry the maximum wheel load under normal conditions without undue wear, with diameter no less than that shown for maximum load in Table 4.7.1.2 of CMAA Specification No. 74 for 40 lb. ASCE crane rail.
  - b. Bridge Drive: Provide bridge drive arrangement A4 of CMAA Specification No. 70 - 4.8 Bridge Drives, consisting of a cushioned start motor with self-contained gear reduction unit at each end of the bridge, driving the bridge wheels by suitable shafts and couplings. Arrange gearing to operate in an oil bath. Provide the drive with a mechanical brake for positive but soft cushioned braking.

C. Underhung Trolley Wire Rope Hoist

1. Trolley Frame: Provide trolley frame of welded rolled steel or cast steel construction, or a combination of both.
2. Hoisting Drum: Fabricate the hoisting drum of high-grade cast iron or steel to withstand the maximum bending and crushing loads. Design the drum so that not less than two complete wraps of hoisting rope remain in the grooves when the hook is in the lowest position, and there is no overlapping when the hook is in the highest position. Turn drum grooves from solid metal, grooved right- and left-hand for double reeving, and provide grooves not less than one half the nominal wire rope diameter in depth. Provide the pitch diameter of the drum and running sheave not less than 24 times the nominal rope diameter. Equip the drum with shrouded flanges or the equivalent to prevent cable override. Install an adjustable geared limit switch at the upper and lower

limits of the hook travel, and an overload cutoff to prevent application of forces greater than the specified capacity of the hoist.

3. Drive: Provide a trolley of the electric motor-operated type with electric motor-operated wire rope hoist.
- D. Hoisting Wire Rope: Design hoisting rope especially for crane service and consisting of 6 x 37 type preformed improved plow steel strands over a fiber core.
1. Wire Size: Size the hoisting wire rope in accordance with OSHA requirements and the crane manufacturer's recommendation, and provide the rated load plus block weight divided by the number of parts of rope not to exceed 20 percent of the nominal breaking strength of the rope.
- E. Bearings: Provide bearings of the ball or roller type, conforming to the standards of the Anti-friction Bearing Manufacturers Association. Bearing housings shall be split or otherwise designed to permit easy removal of the shafts. Prelubricate and seal bearings for life.
1. Design bearings in the crane wheels, drive shaft bearings and gear reduction shaft bearings for a minimum B10 bearing life of 5,000 hours.
- F. Hoisting Blocks: Provide hoisting blocks of enclosed steel construction with forged steel hooks with spring-operated safety latches, supported on ball or roller bearings. Design hooks to rotate freely 360 degrees on the bearing support.
- G. Gears: Design gearing to meet the requirements of Section 4.2 of CMAA Specification No. 74 and AGMA Standards, and of helical or spur type constructed of heat-treated steel. Provide worm gears of bronze and with precision machined cut teeth. Provide pinions of heat-treated alloy steel. Enclose or guard gearing and provide either oil bath or splash lubrication.
1. Design the gear reducer or gear motor specifically for crane service with minimum classification of Moderate Shock service and with minimum service factor of 1.0.
- H. Brakes: Equip the hoist with a Weston or multiple disc type mechanical brake which shall automatically hold the load indefinitely in any position and permit it to be lowered without acceleration under full control. In addition, provide a dc magnetic brake, spring set and magnetically released or solenoid-operated shoe type motor brake acting directly on the motor pinion shaft the instant power is shut off, equally effective in both directions. Provide brakes which are adequate to sustain the capacity load, capable of at least fifteen operations per minute, and permit smooth operation for inching.

## 2.03 ELECTRIC MOTORS

- A. Provide motors meeting the requirements of Section 16220 except as modified below.
  - 1. Design hoisting equipment drive motors specifically for hoist service, conforming to NEMA Standards Part 18 - Subsection "Integral-horsepower AC Crane Motors". Provide horizontal shaft, totally-enclosed, non-ventilated, Class B insulated, 30 minute duty rated, high torque, high slip, induction motors, 1800 rpm maximum speed, suitable for operation at 480 volts, 3-phase, 60 hertz. Provide motors with lifetime lubricated ball bearings. Design motor and gear assembly for the crane application and provide Type D motors flange mounted to the gear reducer or integral motor and gear reducer. Provide motors whose maximum noise level measured 5 feet from each motor does not exceed 90 dBa.

## 2.04 OPERATION AND CONTROLS

- A. Provide operation and control equipment meeting the requirements of Section 16055 – Electrical Requirements for Shop-Assembled Equipment.
- B. Starters: Provide each bridge crane motor with an integral reversing starter, complete with automatic reset overload relays in NEMA 4X stainless steel enclosure. Arrange all components for positive starting in each direction.
- C. Standards: Provide components complying with the NEMA Standards for Industrial Control for Cranes and Hoists, NEC, and ASME B30.16.
- D. Limit Switches: Provide hoisting controls which include an adjustable limit switch to limit the normal up and down travel of the hook with a second factory set fixed switch operated by the hook or block to stop the hoist when the highest safe point is reached. Furnish adjustable limit switches of the heavy-duty control circuit or power circuit type and factory set fixed limit switches of the power circuit type. Connect limit switches to open the motor circuit and apply the brake, but not to prevent lowering by operation of the appropriate push button. Provide switches in enclosures of the same NEMA rating as the associated motor starter, and designed and installed so that they will not be damaged by swinging of the hook.
- E. Pendant Push Button Control Station: Support pendant push button control stations by a Type 304 stainless steel cable or chain paralleling the control cable sized to withstand any effort to pull the hoist with the cable. Provide control transformers for operating the pendant controller at 120 volts ac. Provide each control cable of NEC Type S0 and to include the required number of flexible No. 14 AWG copper conductors, all cabled with necessary fillers and tape, and a tough polyvinyl chloride sheath of at least 45 mils thickness. Ensure they are in one piece, without flaws, and supported by a Kellems type safety grip.

1. Locate the pendant push button controller approximately three feet six inches above the operating floor similar to No. 2 of Figure 4 of Recommended Arrangement of Controllers, ASME B30.2 Section 2-1.10.3 Controller (k). Provide an indicating light to show that power is available. Furnish two push buttons for each motor, one for each direction of travel. Provide all push buttons of the momentary contact maintained pressure type, automatically de-energizing when the contact pressure is relieved. Enclose pendant controllers in the same type of NEMA enclosures as specified for the associated motor starters. Manufacture the pendant controller push-button station of weatherproof nitrile-vinyl rubber or light-weight resilient molded Lexan for nonexplosion-proof enclosures.

## 2.05 POWER SUPPLY

- A. General: Provide all electric power supply equipment suitable for 480-volt, 3-phase, 60-hertz electric service. Provide all hoisting equipment with suitable junction boxes for connection of field services and complete with a ground pad.
- B. Conductor Bar Type: Provide power supply consisting of the single conductor bottom entry electrification type to include a system of safety shielded covered conductors, one set extending the length of the room along the crane rail support beam, as shown, and a second set to extend the length of the bridge for the trolley hoist electrification.
  1. Provide conductors of galvanized steel, figure 8 construction with rigid polyvinyl-chloride covers, rated at not less than 90 amperes continuous. Securely support conductors with hanger clamps and end covers, with pickups firmly held by collector arms. Provide the power supply originating at a junction box located as shown.

## 2.06 SHOP PAINTING

- A. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09912 – Interior Painting.
- B. Finish paint ferrous metal surfaces in the shop using the manufacturer's approved standard finish system. Finish system shall be compatible with the primer specified in Section 09912 – Interior Painting.
- C. Coat machined, polished, and non-ferrous metal surfaces and similar unpainted surfaces with corrosion prevention compound, which shall be maintained during storage and until equipment begins operation.
- D. Stainless Steel: Do not paint stainless steel.

**2.07 SOURCE QUALITY CONTROL**

- A. The crane shall be fully assembled at the manufacturer's facility prior to shipment. The manufacturer shall provide adequate tests to demonstrate the capability of crane components, and compliance with this specification.
- B. Members of the City of New York and the Commissioner shall be allowed to witness any and all tests performed at their discretion.
- C. The crane shall be installed in accordance with an Installation Procedure compliant with Section 01732 - Installation of Equipment.
- D. The crane manufacturer shall prepare a Recommended Installation Procedure. This procedure shall be incorporated into the Contractor's final installation procedure.
- E. The crane manufacturer shall submit a Test and Inspection Plan that ensures full compliance with Section 01811 - Preliminary and Final Field Tests and Section 01431 - Quality Assurance Inspection.
- F. The Contractor shall review and approve the crane manufacturer's plan before submittal to the City of New York for approval, including designated hold/witness points. Upon approval by the City of New York, it shall constitute a part of this specification and shall be implemented by all responsible personnel involved in the manufacturing, inspection or testing of items covered by this specification.
- G. All tests shall be performed according to written test procedures referenced in the Test and Inspection Plan. The Contractor shall review and approve all manufacturer test procedures and data sheets to verify adequacy of the test results. Manufacturer shall document all inspection and test results in Inspection and Testing Reports. These reports shall be submitted to the Contractor for evaluation and approval. After review and approval, the Contractor shall submit the reports to the City of New York for review and approval.

**2.08 SHOP TESTS**

- A. Test the hoisting equipment in the shop for static and dynamic loads in accordance with manufacturer's approved testing protocol.
- B. Certified Shop Tests
  - 1. Certified shop tests shall be performed in accordance with General Conditions, Article 13 - General Electrical and Mechanical Requirements, and Section 16220 - Electric Motors.
  - 2. Shop tests shall also be performed in accordance with the requirements of ASME B30.17.

3. Shop load test certificates shall be submitted prior to equipment delivery.
4. Quality Assurance shall be in accordance with Section 01431 - Quality Assurance Inspection.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install the bridge cranes in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Section 01732 – Installation of Equipment.
- B. The Contractor shall verify all field dimensions for the top-running crane to be installed and correct conditions detrimental to the proper and timely completion of work. The Contractor shall not proceed with installation of the crane until unsatisfactory conditions have been corrected.
- C. Furnish and install all required lubricants for initial operation.

#### 3.02 FIELD PAINTING

- A. Provide field touch-up painting of scratched or damaged surfaces, using primer, intermediate and finish paints provided by the manufacturer in accordance with Section 09912 – Interior Painting.

#### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Furnish the services of a qualified representative of the manufacturer to provide instruction on the proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the start-up of the equipment, participate in the field testing of the equipment, and place it in initial trouble-free operation as specified in Division 1.
- B. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.
- C. Field Tests
  1. After installation of the bridge crane, control equipment and all appurtenances, subject the unit to a field running test, as specified in Section 01811 – Preliminary and Final Field Tests, under actual operating conditions. Test the bridge crane in accordance with ASME B30.16 specifications, CMAA Standards, and NYC Building Code requirements. Operate the hoist through a complete lift and lowering cycle and through complete travel of the

bridge and trolley to determine that the equipment will perform the function of hoisting, braking and traveling quietly, smoothly and safely without failure of any parts. Test the hoisting equipment to as near capacity as possible with available loading facilities such as material or equipment which is readily available within the area served that can be used for producing the loads. Promptly correct defects in the equipment indicated by the tests.

- a. Prior to applying electrical power to any motor-driven equipment, the drive motor shall be rotated by an external source to demonstrate free operation of all mechanical parts.
  - b. Contractor shall provide all necessary instruments, labor, tools, and materials to conduct the field tests.
2. In the event that the Contractor is unable to demonstrate that the equipment meets the requirements of the above-described tests, the deficient equipment will be rejected and Contractor shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements.

#### 3.04 TRAINING

- A. Training shall be performed in accordance with Section 01821 – Training.
- B. The crane manufacturer shall provide a minimum of 8 hours of on-site training at the transfer station for crane operation and maintenance personnel.

-END OF SECTION-

**Section 14640**  
**CONTAINER GANTRY CRANE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This specification defines the requirements for the design, manufacture, installation, performance and testing of two electric powered rail mounted double-cantilevered container gantry cranes (the "cranes") and spreader assembly for barge loading/unloading of refuse containers at one (1) transfer station for the City of New York. The container gantry cranes furnished shall be designed and conform to all local applicable codes and requirements as outlined in this specification. This specification provides the minimum requirements for the cranes. The Contractor is responsible for the sizing, selection and installation of equipment to provide optimal performance under the conditions described in this specification. Any deviations from these specifications and/or the standards cited herein shall be clearly delineated and rationale for the deviation provided.
- B. Cranes shall be installed as shown on the Contract Drawings.
- C. The principal items of work include the following: Design, manufacture, installation, and testing of double cantilevered container gantry cranes, electrical power conductor rails, including all appurtenances specified and required for a complete installation.

**1.02 PAYMENT**

- A. Payment for all work described in this specification will be included in the lump sum bid for Bid Item 1, with the exception of the service agreement described in Article 1.12 below.
- B. Payment for the service agreement will be made at the unit price bid as shown on the bid form.

**1.03 RELATED SPECIFICATIONS**

- A. Section 01415 - Miscellaneous Requirements
- B. Section 01451 - Contractors Quality Control
- C. Section 01811 - Preliminary and Field Tests
- D. Section 05120 - Structural Steel
- E. Section 05311 - Steel Floor Deck
- F. Section 05312 - Steel Roof Deck
- G. Section 05660 - Carriage Rail System
- H. Section 05675 - Crane Rail System
- I. Section 07410 - Metal Wall Panels
- J. Section 07610 - Sheet Metal Roofing
- K. Section 09911 - Exterior Painting



L.	Section 13851	-	Fire Alarm and Detection System
M.	Section 16050	-	Basic Electrical Materials and Methods
N.	Section 16060	-	Grounding
O.	Section 16220	-	Electric Motors
P.	Section 16411	-	Disconnect Switches
Q.	Section 16443	-	Panelboards
R.	Section 16445	-	Motor Control Centers
S.	Section 16460	-	General Purpose Dry Type Transformers
T.	Section 16511	-	Lighting
U.	Section 16741	-	Paging Systems
V.	Section 16742	-	Radio Communications
W.	Section 16752	-	Digital Video System

#### 1.04 REFERENCES

- A. The crane manufacturer shall meet or exceed the requirements of the codes, standards, regulations, and procedures, as currently published at the time of manufacture, referenced in this specification for the design, manufacture, installation and testing of the cranes. In the event of conflict between the specification and the codes, the more stringent requirement shall govern and be used. Specific codes and standards to be met are given below:

1. Crane Manufacturers Association of America (CMAA): CMAA Specification No. 70, Class F, (Continuous Severe Service) Revised 2000, "Crane Manufacturers Association of America, Inc., Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes."
2. American Society of Mechanical Engineers (ASME): ASME B30.2-1996, "Overhead and Gantry Cranes," Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist.
3. National Electric Code (NEC), Latest Edition including Article 610 Cranes and Hoists.
4. Society for Protective Coatings (SSPC)
5. Occupation Safety and Health Administration (OSHA)
6. American Society for Testing and Materials (ASTM)
7. American Society of Mechanical Engineers (ASME)
8. Institute of Electrical and Electronics Engineers (IEEE)
9. American Welding Society (AWS)
10. American Gear Manufacturers Association (AGMA)

11. National Electrical Manufacturer's Association (NEMA)
12. National Fire Protection Association (NFPA)
13. Universal Building Code (UBC)
14. International Building Code (IBC)

#### 1.05 SYSTEM DESCRIPTION

- A. The cranes shall be of a double cantilevered design. Two (2) cranes will be required, configured as shown on the Contract Drawings and in this specification. The transfer station shall be furnished with a "Left Hand" and "Right Hand" crane as shown on the Contract Drawings. The cranes shall be designed and constructed in accordance with the Crane Manufacturers Association of America Specification No. 70, Class F, Duty cycle (Continuous Severe Service).
- B. The cranes shall be low-profile rail-mounted, top-running-type, of welded structural steel girder construction. The cranes shall be double wheel type with full equalizing end trucks (bogies), top running trolley, hoist and spreader assembly.
- C. The cranes shall be designed to lift refuse containers of 30 short tons under the spreader. The cranes shall be designed for continuous, simultaneous operation of any combination of hoisting/lowering, trolley and gantry movements. The cranes shall be designed for the gantry to travel with the maximum load at its maximum outreach at maximum speeds.
- D. Manufacturers shall have service representatives in the New York City metropolitan area.
- E. A 480 VAC power feed, with current capacity as required for proper operation of the cranes, will be provided by the City.
- F. Each crane shall be furnished with an electric powered spreader designed to handle refuse-containers 20 feet long by 12 feet high by 8.5 feet wide (Nominal). The spreader shall be capable of handling containers to and from a deck barge provided with cell guides under conditions specified in Part 2, Products, Articles 2.03 and 2.04. The spreader will also be capable of accommodating adverse inclination and alignment of the barges as specified in Part 2, Products, Articles 2.03 and 2.04.
- G. It should be noted that the gantry is continuously traveling along the length of the pier (100 – 120 feet) during normal operations, unlike a typical container crane operation where the gantry travels occasionally. The cranes will be used alternately, with one crane designated as standby.
- H. The crane hoisting equipment shall be provided with an anti-sway reeving system.
- I. The cranes and spreader shall be equipped with a height detection system.

- J. The design of the cranes shall provide easy access and provision for routine maintenance, including inspection, without the use of special tools.
- K. The cranes shall be certified by a Certification Agency Accredited by OSHA under the Regulations of Title 29, Chapter XVII, Part 1919.

#### 1.06 GENERAL REQUIREMENTS

##### A. Pre-Bid

- 1. Before bidding, prospective Contractors shall have the crane manufacturer review site plans, crane arrangement, site and dredge plans referenced in this specification for familiarization with design installation, clearances, and crane operation. The bidder shall obtain all necessary information, and make its own determinations of any and all conditions that may affect in any way the performance of its work under this Contract.
- 2. A Pre-bid Conference and tour of the existing facility will be arranged as indicated in Attachment 1 to the Construction Contract.

- B. Pre-Installation: Prior to installation of the cranes and conductor rails, the Contractor shall survey the transfer station to determine if the facility is ready for the crane delivery and the related equipment bumpers, crane rails, conductor system, and structural supports are acceptable for the crane installation.

- C. Design: The crane manufacturer shall conduct an independent site review and site survey for purposes of design and installation considerations for the crane and bus bar system.

##### D. Project Meetings

- 1. A pre-construction conference will be held prior to starting erection and/or installation and no later than 15 days after the Notice to Proceed. The meeting will be conducted to review responsibilities and personnel assignments and equipment to be used.
- 2. Pre-installation conferences will be held before each crane installation construction activity that requires coordination with other construction.

#### 1.07 SUBMITTALS

- A. In addition to the requirements of Section 01330, additional information shall be provided as outlined in this section.
- B. Submit information and data to show the proposed manufacturer's experience in producing ship-to-shore or rail-mounted gantry cranes, providing contact information for at least three (3) installations for which the crane manufacturer has completed installation.

- C. Submit a list of any items proposed that are not currently Underwriters Laboratories (UL) or Nationally Recognized Testing Laboratory (NRTL) approved. Provide date it will be approved by UL or NRTL or explain why non-approved items are being used.
- D. Submit a crane-testing program, including the hydraulic, electrical and other equipment, in sufficient detail to demonstrate no-load, load and overload tests on the entire crane and components.
- E. Mechanical Concepts: The requirements for the mechanical design of the cranes are described in Part 2, Products. Submit a description of how the Contractor intends to meet the concepts, including:
  - 1. Double-leg gantry assembly of welded steel girder construction.
  - 2. Welded steel construction gantry trucks.
  - 3. Top running trolley assembly and enclosed trolley house.
  - 4. Mechanical anti-sway main hoist assembly system for container lifts.
  - 5. Mechanical list and trim system for operation with containers inclined up to 5 degrees from the horizontal.
  - 6. Trolley and gantry drive assemblies with parking brakes.
  - 7. Festooned or cable carrier trolley power and control cable system.
  - 8. Bar type power conductors and dual-shoe collectors for supplying electric power to the crane as shown on the Contract Drawings.
  - 9. Electronic crane management system (CMS) for the crane and spreader for integration of the crane position system and diagnostic identification.
  - 10. Anti-collision system for detection of parked and operating cranes and detection of equipment, personnel or obstructions on the crane rails.
- F. Electrical Concepts: The requirements for the electrical design of the cranes are described in Part 2, Products. Submit a description of how the Contractor intends to meet the concepts, including:
  - 1. Electrical arrangement of electric room
  - 2. Electrical one line diagram
  - 3. Scheme for electrical isolation of drives
  - 4. Preliminary drive and motor sizing
  - 5. Preliminary brake sizing
  - 6. Main power disconnect
  - 7. Preliminary power demand

8. Festoon and spreader cable details and hardware
9. Maintainability
10. Bus bar conductor power pick-up system
11. Electrical interlocks and safety switches
  - a. Slowdown and stop limit switches for Trolley
  - b. Hoist Slowdown and anti-two block limit switches
  - c. Hoist lower and stop limit and overspeed switches
  - d. Crane overload capacity switch

G. Submit crane stability analysis and wheel load calculations.

H. For the installation submittals, complete manufacturer's installation instructions, including permissible tolerances, shall be furnished with each unit of equipment/crane installation or set of identical cranes/units.

#### 1.08 CRANE IDENTIFICATION

A. The cranes shall be numerically identified as indicated in Table 1.

Crane Identification No.	Type
DSNYCRANE F-CGC-01	Left Hand
DSNYCRANE F-CGC-02	Right Hand

#### 1.09 DELIVERY

- A. The preparation of the site for the arrival of the cranes shall be coordinated between the crane manufacturer and the Contractor.
- B. Crane and Equipment shall not be delivered to the site until it can be installed directly to the crane rails and to the area where the installation can be completed.
- C. All wiring, control panels, access platforms, and other permanently attached items shall be fabricated and attached prior to shipping. The cranes shall be fabricated, assembled and shipped in the largest practicable sections to minimize field erection time.
- D. If the cranes cannot be shipped fully assembled, all field connections shall be match marked, and match mark drawings shall be furnished. Bolts for field connections shall be supplied, with each size separately packaged and identified, and keyed to the match mark drawings for each connection. For each crane, a crane erection drawing shall be furnished, showing the arrangement, weights, and assembly of all shipped assemblies and subassemblies to be installed on the completed crane.

#### 1.10 SPARE PARTS

- A. The crane manufacturer shall provide spare parts in accordance with Division 1 and as specified in Part 2, Products, Article 2.10.

- B. All parts shall be identified with a numerical system to facilitate parts inventory control, stocking and location. A unique number shall properly identify each part. Identical parts shall have the same part number.
- C. Spare parts lists shall be submitted with the operation and maintenance manuals.

#### 1.11 WARRANTY

- A. The crane manufacturer shall provide to the City of New York a thirty-six (36) month unlimited warranty following final certification and acceptance. During that period, the manufacturer shall replace or repair at no additional cost any component that fails to function properly because of improper selection or application of components or as a result of defects in workmanship, material, or design. During the warranty period, the City of New York shall reserve the right to transfer the warranty to a third party.

#### 1.12 WARRANTY SERVICE

- A. The crane manufacturer shall provide a Service Agreement contract to perform periodic inspections, preventive maintenance and repairs to each crane for a period of 3 years following certification and acceptance. The Service Agreement shall be structured to meet the operating requirements detailed in this specification and the maintenance/repair schedule specified in the technical manuals.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide equipment of one of the following manufacturers or an approved equivalent in accordance with Section 01631 – Equivalent Materials and Equipment:
  - 1. American Crane & Equipment  
531 Old Swede Road  
Douglassville PA, 19518  
Contact: Jim Marmer.  
Tel: (610) 385-6061 ext 273; Fax: 1 (610) 385- 3191  
email: [jmarmer@americancrane.com](mailto:jmarmer@americancrane.com)
  - 2. Terex Port Equipment  
10401 Old Georgetown Road  
Suite 304  
Bethesda, MD 20814  
Contact: Mike Krupp  
Tel (202) 686-7672  
Fax: 301 530-7701 Email: [mike.krupp@terex.com](mailto:mike.krupp@terex.com)  
[www.terexcranes.com](http://www.terexcranes.com)

3. PaR Systems Inc.  
707 Country Road E  
West Shoreview, MN 55126-7007 USA  
Tel: (949) 360-6186  
Fax: (949) 360-6145  
Contact: Mark Price  
e-mail: [mprice@par.com](mailto:mprice@par.com)
4. Paceco Corp:  
25503 Whitesell Street  
Hayward, CA 94545  
Tel: (510) 264-9288;  
Fax: +1 (510) 264-9280  
Contact: SalesEmail: [mc@pacecocorp.com](mailto:mc@pacecocorp.com)
5. Seward Wyon Limited  
The Old Tannery,  
Kelston, Bath BA1 9AN  
United Kingdom  
Contact: Les Keeler  
Tel: +44 (0) (117) 932-7565 Fax: +44 (0) (117) 932-7763  
[www.sewardwyon.co.uk](http://www.sewardwyon.co.uk)
6. Shanghai Zhenhua Port Machinery Co. Ltd  
1410 Spence Street  
Los Angeles, CA 90054  
Tel: (510) 812-1661  
Contact: Mr. Jieyi Yang  
Email: [mail@zpmc.com](mailto:mail@zpmc.com)  
[www.zpmc.com](http://www.zpmc.com)
7. Baltkran  
Alexander Nevsky Str., 165  
236008 Kaliningrad, Russia  
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2. Elme North America, Inc.  
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3. NSL Engineering PTE LTD  
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2.02 GENERAL ARRANGEMENT

A. General

1. The cranes shall be of a double-cantilevered type, designed and configured as shown on the Contract Drawings and in this specification. The transfer station will be furnished with a "Left Hand" and "Right Hand" container gantry crane as shown on the Drawings. The maximum height of the cranes measured from the top of the crane rail (pier level) to the top of the trolley house or highest part of the crane shall not exceed seventy four (74) feet. The drawings currently depict the crane structure with pin connections at the waterside legs and a top rail running trolley with the machinery house integral to the trolley. If the crane manufacturer cannot comply with this configuration, it shall advise the Contractor in advance of the change in the design and shall justify the deviation from the arrangement shown on the drawing. However, if the machinery house is fixed, it shall be located to straddle the landside legs of the crane. The machinery house shall not extend beyond the outline dimensions and shall be configured as shown on the contract drawings. The crane manufacturer shall also notify the Contractor in advance of changes in design of the drives, machinery or other components/systems to justify deviations from this specification.

2. The cranes shall be low-profile rail-mounted, top rail running type, of welded structural steel girder construction. The cranes shall be double flanged wheel type with full equalizing end trucks (bogies), top running trolley, hoist and spreader assembly.
3. The cranes shall be designed to lift 30 short tons (60,000 pounds) under the spreader. The cranes shall be designed for continuous, simultaneous operation of any combination of hoisting/lowering, trolley and gantry movement. The cranes shall be designed for the gantry to travel with the maximum load at its maximum outreach at maximum speeds.
4. The weight of the cranes shall be as light as practical without sacrificing the stability and integrity of the structural design or jeopardizing safety of operation. Design requirements for wheel loads in Part 2, Products, Articles 2.03 and 2.04 shall not be exceeded.
5. Each crane shall be designed to operate for two continuous working shifts (16 hours per day) with only one crane in service at a time. The Contract Drawings depict the operation, loading and unloading scenarios for the cranes.
6. A total crane management system (CMS) shall be provided for diagnostic checks of all components and supplying information for troubleshooting, maintenance and repairs for the cranes and spreaders. The CMS shall also be furnished with an automatic positioning and height detection system.
7. Each crane shall be furnished with an electro-hydraulic spreader with a lifting capacity of 30 short tons (60,000 pounds) to handle refuse-containers 20 feet long by 12 feet high by 8.5 feet wide (Nominal). Guidance dimensions and tolerances for the refuse containers shown on the Contract Drawings shall be used for spreader design.
8. The spreaders shall be capable of handling containers to and from a barge provided with cell guides under conditions specified in Part 2, Parts, Articles 2.03 and 2.04. In addition to the standard operating and automation features (spreader's twistlock condition indicators—locked/unlocked, positioning flippers location – horizontal / vertical), the spreaders shall be equipped with automated height detection system, side shift capability, noise reduction and other automation and control features.
9. The crane hoisting equipment shall be provided with an anti-sway reeving system, to assist the operator in controlling the load during simultaneous operations.
10. The maximum distance between the crane bumpers at the base of the gantry shall not exceed thirty-six (36) feet as depicted on the Contract Drawings. All structures, equipment and access fittings shall be within this requirement and as shown on the Contract Drawings.

11. The cranes shall be provided with an anti-collision system to prevent the operating crane from colliding with the parked crane, and detect personnel, equipment or obstructions on the crane rails. Design of the system shall be as specified in Part 2, Products, Article 2.07.
12. The spreaders shall be provided with a height detection system (encoders, lasers and geared limit switches, etc.) integrated with the CMS. The cranes shall be furnished with an automatic positioning and height sensing system for spotting and stacking containers on the shuttle cars, the pier and the barge. These systems shall also be used to pre-program automatic hoist lowering of containers to reduce impact noise levels between the containers, barge, pier and shuttle car. The distances for slowing down the cranes at designated locations shall be as shown on the Contract Drawings.
13. All electrical, control equipment and devices shall be placed and mounted inside the trolley house for ease of maintenance and trouble-shooting. The configuration of the trolley house shall be as shown on the Contract Drawings.
14. The cranes shall be provided with a small hoisting jib or davit on the back reach walkway platform for lifting light equipment/components from the pier to the crane.
15. The cranes shall be furnished with a list/trim compensation system designed to operate with the container barge at an adverse inclination of 5 degrees and skew up to 5 degrees from the pier. The skewing feature shall be designed to compensate for angular barge movement.
16. The cranes shall be provided with clearly visible label plates with the safe working load (SWL) specified. Warning plates shall also be provided as shown on the Contract Drawings. All label and warning plates shall be in accordance with OSHA and CMAA No. 70 specifications.

**B. Trolley House**

1. The trolley house shall be equipped with a powered overhead handling system or jib to install or remove the heaviest equipment from the crane to the pier.
2. An access opening with a hinged or sliding door shall be provided in the deck of the trolley house for removal of equipment onto the pier. The opening shall be sized to allow the removal of the largest piece of equipment.
3. The trolley shall be provided with a trolley house structure configured as shown on the Contract Drawings. Siding and roof materials for the trolley house shall be in accordance with Section 07410 - Metal Wall Panels and 07610 - Sheet Metal Roofing. The trolley house shall be painted in accordance with Part 2, Products, Article 2.09.

4. The trolley house shall be ventilated and grounded in accordance with Part 2, Products, Article 2.07 Electrical Equipment and Components. A climate controlled and grounded enclosure shall be provided for control systems and other sensitive components.
5. The deck of the trolley house shall be solid to prevent materials and equipment from falling down to the pier level.

C. Operator's Cab

1. The enclosed crane operator's cab shall be suspended below the trolley and oriented such that the operator's view is unobstructed and to provide optimal visibility as shown on the Contract Drawings. The equipment in the cab shall be furnished as specified in Part 2, Products Article 2.07.
2. The enclosed operator's cab shall be steel framed and equipped as follows:
  - a. Upholstered foldable, adjustable swivel seat with dual axis control console. The console shall be equipped with master controls and necessary push buttons for crane and spreader operations as specified in Part 2, Products, Article 2.07. The controls shall be furnished with "dead man" protection for safety switches, and spreader controls.
  - b. Operator's cab controls as in Part 2, Products, Article 2.07
  - c. Diagnostic monitor
  - d. HVAC with thermostatic control
  - e. Audible and visual alarm indicators/controls and safety warning devices. Audible alarm shall be provided with a manual shut-off switch
  - f. Windshield wipers and window defoggers
  - g. Electrical duplex outlet (120 VAC, 20 Amp)
  - h. Wall-mounted light switch
  - i. Fire extinguisher
  - j. Access to the cab shall be from the trolley or trolley house. Emergency egress (portable ladder) shall also be provided from the cab as required by OSHA.

- k. Full anti-glare glass enclosure all around and partially through the floor. For full visibility, back mirrors and a CCTV camera shall also be provided. The CCTV camera shall enable the crane operator to view the waterside and barge while traversing the trolley.
- l. Means shall be provided to clean the windows from inside the cab.

## 2.03 DESIGN LOADS

- A. The duty cycle of the cranes is to be based on two (2) cranes being alternately used 16 hours per day, 6 days a week for a total of 2,500 hrs/year/crane. One crane is on standby while the other is in continuous operation. The scheduling of the active and standby crane will be determined by the City of New York.
- B. The design loads shall be based on the rated capacities specified in Part 2, Parts, Articles 2.03 and 2.04. For the purpose of design, all structural and mechanical parts, loads, loading combinations, load cases and allowable stresses shall be in accordance with the latest CMAA No. 70 Specification class F (Continuous Severe Service).
- C. The maximum allowable corner loads and rail loads per foot are specified in the gantry crane requirement Part 2, Parts, Articles 2.03 and 2.04 and the Contract Drawings. The corner loads and rail loads shall be calculated using both static and dynamic forces with applicable load factors as shown Part 2, Parts, Articles 2.03 and 2.04 for guidance.
- D. The dead loads shall include all weight except the movable head block, wire ropes, spreader beam and lifted load.
- E. Wind loads specified in Part 2, Parts, Articles 2.03 and 2.04 shall be applied where applicable to the horizontally projected area of the crane and load container. No shielding effect of one element by another shall be considered where the distance between them exceeds four times the smaller projected dimension of the windward element. Appropriate shape factors shall be applied.
- F. Ice loads on the crane shall be applied as specified in Part 2, Parts, Articles 2.03 and 2.04.
- G. The gantry cranes shall have a minimum factor of safety of 1.25 against overturning under each condition of loading, including hoist Vertical Impact Force (VIF) in accordance with CMAA No. 70, travel acceleration forces and occasional operating winds from the adverse direction all considered. To prevent overturning in the parked and stowed position due to loads specified in Part 2, Parts, Articles 2.03 and 2.04, the cranes shall be provided with four (4) turnbuckle or tie-down assemblies at each of the waterside legs of the cranes and two (2) turnbuckle assemblies at each land side leg. The tie-down assembly shall be designed for the maximum load specified in Part 2, Parts, Articles 2.03 and 2.04. Padeyes for lashing to pier shall be installed in accordance with the Contract Drawings.

- H. The gantry cranes shall be seismically designed for maximum seismic load with the maximum load on the hook to survive an International Building Code (UBC) specified earthquake for the New York region. CMAA No. 70 level three (3) stress case shall be used for designing the crane for the assumed seismic load. The cranes shall not be required to hold the rated load or function during or after the earthquake however, the gantry structure shall remain intact during and after the earthquake.
- I. With the cranes in the parked and stowed position, the pin locks shall be designed to prevent movement of the cranes when:
1. The wind speeds are 100 miles per hour.
  2. The operating crane collides with the parked crane.
- J. Pier Level Load Descriptions

Table 2: Pier Load Descriptions

Load	Designation	Description
Crane Dead Load	DL	Weight of crane structure including permanently attached machinery and equipment, but excluding trolley (TL) and lifting system (LS)
Trolley Load	TL	Weight of trolley including permanently attached machinery and equipment, but excluding lifting system (LS)
Lifting System	LS	Weight of spreader, head block, lifting ropes, sheaves and other equipment which hangs from the main hoist ropes and is supported by the container when the spreader is placed on it.
Lifted Load	LL	Weight of container plus contents
Impact Load	I	Load due to barge cell Vertical acceleration of the lift as sensed by the main hoist ropes. Taken as $0.25(LS+LL)$
Lateral Trolley Load	LTL	Load due to acceleration/deceleration of $(TL+LS+LL)$ . Depends on specific crane's operating speeds. Use $0.1(TL+LS+LL)$ as a minimum.
Longitudinal Gantry Load	LGL	Load due to acceleration/deceleration of the gantry drive system. Use 150 percent of the inertia force developed by the specific system used. Use a minimum of $0.05(DL+TL+LS+LL)$ . Add a fraction of LTL acting simultaneously (minimum 25 percent), as appropriate for the specific crane operating system.

Table 2: Pier Load Descriptions

Load	Designation	Description
Operating Wind Loads	WOT, WOL	Effect of 35 mph wind on operating crane, including effects of wind on full or empty container. Consider wind in both the transverse (WOT) and longitudinal (WOL) directions.
Stowed Wind Loads	WST, WSL	Effect of 100 mph on stowed crane without container. Consider wind in both the transverse (WST) and longitudinal (WSL) directions.
Seismic Loads	EQT, EQL	Effect of design seismic event on crane. It is assumed that the crane is not in the middle of a lifting cycle during this event; therefore EQ does not apply to LL. Consider seismic excitation in both the transverse (EQT) and longitudinal (EQL) directions, and combinations thereof as required by the New York City Construction Codes.
Snag Load	SN	Load imposed on crane due to head block and empty spreader jamming in cell guide while traveling at maximum hoist speed.
Collision Load	CL	Load due to crane, traveling at full speed with power off, hitting either the crane stops or the facility's other crane.
Stall Torque Load	STL	Load developed by stalling any motor in the crane. For AC drives use stall and/or breakdown torque; for DC drive use 200 percent of rated motor torque. For main hoist, stall torque is load induced by stalling hoist motors with one end of a container dogged down.

The above loads would be used in factored load combinations shown in Table 3.



## K. Load Combinations for Crane Operating, Overload, and Stowed Conditions

Table 3: Load Combinations and Factors

Combinations:		Operating		Overload			Stowed	
Crane Dead Load	DL	1.4	1.4	1.2	1.2	1.2	0.9/1.2	0.9/1.2
Trolley Load	TL	1.4	1.4	1.2	1.2	1.2	0.9/1.2	0.9/1.2
Lifting System	LS	1.4	1.4	1.2	1.2	1.2	0.9/1.2	0.9/1.2
Lifted Load	LL	1.7	1.7		1.0			
Impact Load	I		1.4					
Lateral Trolley Load	LTL		1.4					
Longitudinal Gantry Load	LGL	1.4						
Operating Wind Loads	WOT, WOL	1.7	1.7	1.0	1.0	1.0		
Stowed Wind Loads	WST, WSL						1.6	
Seismic Loads (IBC)	EQT, EQL							1.0
Snag Load	SN					1.0		
Collision Load	CL				1.0			
Stall Torque Load	STL			1.0				

## 2.04 CRANE PERFORMANCE REQUIREMENTS

## A. Performance and Principal Characteristics

CMAA Specification 70 Service Classification	Class F (Continuous Severe Service)
Maximum load capacity under the spreader	30 short tons
Maximum duty time per one crane cycle	170 sec *
Gantry speed	230 ft/min
Gantry acceleration /deceleration rate	1.41 ft/sec <sup>2</sup>
Gantry acceleration /deceleration rate (Loaded)	0.95 ft/sec <sup>2</sup>
Trolley speed	400 ft/min
Trolley acceleration /deceleration rate	1.67 ft/sec <sup>2</sup>
Hoist speed (Empty)	340 ft/min
Hoist speed (Loaded)	170 ft/min
Hoist acceleration /deceleration rate (Empty)	1.41 ft/sec <sup>2</sup>
Electric Power supply to the crane	480V, 3 ph, 60 Hz
Gantry crane rail span (center to center)	50.00 ft

Design Requirements:	
Maximum allowable corner load (factored)	830 kips
Maximum allowable corner load (Service)	560 kips
Maximum rail loads (Per foot)	85.1 kips/ft
Crane operating temperatures	-20°F to 120°F
Maximum barge inclination	5 degrees from horizontal plane
Maximum barge skew from pier	5 degrees
Operating wind conditions	35 MPH
Storm wind conditions (stored crane)	100 MPH
Design factors of safety	In accordance with CMAA No. 70
Ice load	3 lbs/ ft <sup>2</sup>
Tie-down / turnbuckle assembly	113.50 kips (each)

\* The crane cycle is defined as removing a loaded container from the further, most shuttle car and loading it to the lowest/furthest cell on the barge, then returning the full container back to the same shuttle car.

#### B. Crane Noise Levels

- Maximum permitted noise levels at distance of 50 feet from the noise source at a height of 5 feet above grade level as indicated in the following table..

Table 5: Maximum Permissible Crane Noise Levels

Gantry Crane Spectral Noise Level	Frequency (Hz)							
	63	125	250	550	1k	2k	4k	8k
Maximum Allowable Level (dB)	79.0	82.5	81.2	72.9	69.7	64.6	60.9	55.9

### 2.05 STRUCTURAL COMPONENTS

#### A. Crane Structure

- The gantry cranes shall be of steel box section construction for bridge girders, legs, and sill beams fabricated of welded steel plates with full depth diaphragms. The gantry legs shall be supported on steel plate sill beam designed to distribute the maximum corner loads for full equalization on the end trucks.

2. The welded steel girder construction shall be designed in accordance with CMAA No. 70. Allowable girder deflection along the span between the gantry leg supports shall be in accordance with CMAA No. 70 Specifications.
3. The drawing currently depicts two land side legs as a shear leg design and the two waterside legs of pivot type. Alternative structural arrangements may be proposed by the Contractor provided the manufacturer justifies the changes to the design and provided supporting rationale in advance.
4. Connections
  - a. If the cranes are assembled on site, the gantry legs, bridge and end truck shall use field bolted connections with high strength bolts in accordance with the "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - b. Shop connections shall be designed for assembly by means of welding or by bolting. Welding shall not be associated with bolting in the same joint. Field connections shall be designed for assembly with bolts of the type specified for the application. Riveting will not be acceptable.
  - c. Welded connections shall be designed in accordance with the applicable provisions of AWS D1.1-97, and provisions for repeated stress will not be required.
  - d. Bolted connections shall be designed as follows:
    - (1) Machine bolts or fitted bolts shall be used for assembly connections on machine parts, trucks, trolley frames, attaching machine parts, and similar items.
    - (2) ASTM A 325 or ASTM A 490 type bolts shall be used on structural bolted connections carrying primary loads.
    - (3) ASTM A 307, ASTM A 325, or machine bolts shall be used for bolted connections on the cab, ladders, guard rails, and similar structural items.
    - (4) Bolted connections of the gantry and trolley assemblies and trucks shall be machine finished at the mating surfaces.

## 2.06 MECHANICAL COMPONENTS

### A. Gantry Pin Locks

1. Parking lock pin assemblies (2) mounted at each side of gantry as shown on the Contract Drawings.

2. The crane pin locks shall engage into slots recessed into the pier as shown on the Contract Drawings.
  3. Pin lock sockets in the pier shall be installed by the Contractor as shown on the Contract Drawings.
- B. Trolley Pin Locks: The Trolley shall be stowed over the land side leg when not in use. Pin locks shall be used for the stowed position.
- C. Gantry Truck Assemblies
1. Each crane shall be provided with two (2) truck assemblies at each leg as shown on the Contract Drawings. Each truck shall contain a drive and an idler wheel for a total of eight (8) drives and eight (8) idler wheels. The crane shall have a total of sixteen (16) wheels.
  2. Each drive unit assembly shall consist of a motor, gear reducer and brake.
  3. The wheels shall be double flanged with machined treads, hardened to a minimum Rockwell C 68 using a deep hardening carbonized heat treated process. Wheels shall be designed in accordance with CMAA No. 70 guidelines for the loading, class of service, and rail size selected.
  4. Wheel bearings for gantry trucks shall be designed in accordance with CMAA No. 70 class F (Continuous Severe Service).
  5. Four (4) energy absorbing hydraulic bumpers designed for a sixteen (16) inch impact stroke shall be provided as shown on the Drawings. The bumper shall be capable of absorbing 100 percent of the rated gantry speed with deceleration not to exceed 16 fpsps at 50% of the full load travel speed. One bumper shall be mounted at the center of each corner (sill beam) of the crane. End force per bumper shall not exceed 215 kips at impact with motor off. The design of all bumpers shall include safety cables to prevent parts from falling to the floor. The bumper shall be located 4.75 feet above the top of the rail. The capacity and size shall be designed in accordance with the impact requirements specified in Part 1, Products, Articles 1.03 and 1.04 and OSHA CFR 1910.179(e)(2).
  6. Gantry trucks shall be designed to minimize the danger of damage to the crane or surroundings in the event of failure of any part of the truck. Lugs or bearing plates shall be provided at the bottom of each truck frame (at the centerline) to limit the drop to less than 1 inch in the event of a broken wheel axle or other failure. End trucks shall be fastened to the gantry legs in a manner that ensures rigidity and squareness.
  7. Gantry trucks shall be designed and fabricated to provide equalized wheel loads.

8. Truck wheelbase shall be as shown on the Contract Drawings.
9. Gantry trucks shall be equipped with rail sweeps which extend below the top of the rail and project in front of the truck wheels in accordance with OSHA 1910.179(e).
10. Protective wheel guards shall be provided on the gantry trucks for safety.

D. Gantry Drives

1. The gantry cranes shall have a minimum of eight (8) drive axles.
2. A gear reducer and flange mounted DC disc brake shall be provided with the drive assembly. The brake shall be sized for 200 percent of the full load motor torque, or as required to prevent wheel skid, and shall have thermal capacity sufficient for an emergency stop from full speed. The brakes shall be designed to hold the crane in position and prevent movement with a headwind pressure resulting from a 60 MPH wind. The wind force shall be applied to the exposed surfaces of the crane (in the direction of gantry travel) and with a static coefficient of friction of 0.20 between the wheels and the runway rails.
3. The speed and power output of the motors and drives shall be synchronized and driven by a common motor controller. The drives shall be designed such that the travel motion will be steady and have a minimum of vibration or racking while moving at the maximum rated speed, with a maximum rated load, plus the added horizontal headwind specified in Part 2, Products, Articles 2.03 and 2.04.
4. The capacity of the gantry travel motors shall be sufficient to provide the specified performance without exceeding their full-load torque rating at the specified operating load and wind. The tractive effort, used to overcome the rolling friction of the wheels and the mechanical losses of the drive, shall be a minimum of 12 pounds per ton or as specified in CMAA No. 70 for the diameter of wheel used.
5. The brakes shall be used for holding the crane in position for any combination of hoisting/lowering/trolley movements. The controls shall be designed to permit dynamic or regenerative braking of the gantry during all normal operations. If required, a time delay shall be integrated into the control system to permit dynamic braking and prevent skidding of the crane.

E. Trolley Assembly

1. The trolley shall be top running type, structural steel welded construction for strength and rigidity, and properly aligned to support the main hoisting machinery, trolley drive, and the suspended operator's cab. The trolley structure shall be designed to stress levels as required by, Article 3.9 of the CMAA No. 70 Specification.

2. The trolley drive assembly shall be designed in accordance with Article 4.10 of CMAA No. 70.
3. Hoist running and equalizing sheaves shall be mounted above the trolley deck or as required by the manufacturer for ease of inspection and maintenance.
4. The trolley shall be driven at each corner and have a minimum of four (4) wheels. Wheels shall be arranged to minimize the damage to the crane or surroundings in case of failure of any part of the wheel assembly. Lugs or bearing plates shall be provided under the trolley at each corner to limit the drop to not more than 1 inch in the event of a broken axle or other failure.
5. Trolley wheels shall be steel, double flanged, machined treads with treads hardened to Rockwell C 60 minimum using deep hardening carbonizing heat treatment process. Wheels shall be designed in accordance with CMAA No. 70 guidelines for the loading, class of service, and trolley rail size selected.
6. The trolley shall be provided with energy-absorbing bumpers designed in accordance with OSHA requirements.
7. The trolley shall be equipped with rail sweeps which extends below the top of the rail and project in front of the trolley in accordance with ASME B30.2-1996, "Overhead and Gantry Cranes."
8. The trolley shall be provided with rail clamps, anchor pins, or other means to prevent the trolley from tipping or leaving the rail while operating.

F. Trolley Drive

1. The drive shall consist of an AC motor/gear reducer and a flange mounted DC disc brake. The disc brake shall be sized for 150 percent of the full load motor torque.
2. The drives shall be designed such that the travel motion will be steady, smooth and have minimum vibration or racking while moving at rated speed, rated load, plus the added horizontal wind pressure specified in Part 2, Products, Articles 2.03 and 2.04 resulting from headwind, on the combined vertical projected area of the trolley structure.
3. The trolley travel motors shall be adequately sized to provide the specified performance without exceeding their full-load torque rating. The tractive effort, used to overcome the rolling friction of the wheels and mechanical losses of the drive, shall be a minimum of 12 pounds per ton or as specified in CMAA No. 70 for the diameter of wheel utilized.

**G. Trolley Rails**

1. The trolley rails shall conform to CMAA No. 70. The rails shall be accurately aligned on the girders to ensure smooth and shock-free travel.
2. Fixed end stops shall be provided at both ends of the rail girders and aligned with the trolley bumpers in accordance with CMAA No. 70.

**H. Hoist Assembly**

1. The hoist assembly shall be provided with a quick connect head block system with manual twist locks for connecting the spreader to the head block for ease of replacement.
2. The hoisting machinery shall be capable of lifting the rated load at the maximum speeds specified in Part 2, Products, Articles 2.03 and 2.04.
3. The hoist assembly shall consist of a hoisting motor, gear reducer and single type disc brakes. Disc brakes shall be Pintsch-Bubenzer or an approved equal.
4. The hoist assembly shall be provided with a manual anti-sway wire rope reeving system to the headblock. The anti-sway system shall be designed to permit limited motion of the load while the trolley and gantry are in motion.
5. The main hoisting drum shall be fabricated of welded steel plate. The drum shall have machined grooves and be provided with a flange for a secondary emergency brake.
6. If final gear reduction is made at the drum, the drum gear shall be bolted and doweled, or shrunk fit onto the drum.
7. With the headblock in its lowest position, a minimum of three wraps of wire rope shall remain on the drum. Space for one additional winding shall be provided with the headblock in its highest position.
8. The wire rope attachment to the drums shall be designed such that adjustment and replacement of rope may be accomplished without dismantling the drum assembly. The pitch diameter of the drum shall not be less than thirty (30) times the diameter of the hoisting rope.
9. The drum material shall be in accordance with the CMAA No. 70. The combined bending and crushing stress for the drums shall not exceed 20 percent of the drum material yield strength, at rated loads.
10. The drum shall be provided with drum flanges at each end to prevent the rope from jumping the drum shell.
11. A mechanical or hydraulic energy absorbing system shall be provided to protect the hoisting machinery from load hang-up and two-blocking. The

holding brake shall remain effective during the actuation of the mechanical energy-absorbing device.

12. Rope sheaves shall be forged or rolled steel construction hardened to a minimum of Rockwell C 60 using the deep hardening carbonizing heat treatment process. The sheaves shall have deep flanges, shall be properly grooved for wire rope fit, and shall be accurately machined and smoothly finished to reduce rope wear. The pitch diameter of running sheaves shall be not less than 30 times the rope diameter. The pitch diameter of equalizing sheaves shall be not less than half the diameter of the running sheaves. All sheaves shall be equipped with anti-friction roller bearings. The bearings shall either be designed for the axial thrust loads on the sheaves or suitable bronze thrust washers shall be provided. Each sheave shall be lubricated automatically by an individual grease passage located within the sheave pin, or shall be sealed type requiring no routine lubrication. The trolley sheaves shall be located above the trolley platform or be arranged to be readily accessible from the trolley platform.
- I. Wire Rope: The size of hoisting ropes shall be determined from the maximum rope tension resulting from maximum rated load of the loaded container, the container spreader assembly, and the headblock assembly used. The increased rope tension resulting from the anti-sway reeving angles shall be taken into account for wire rope size. The rope tension shall not be greater than 20 percent of the nominal breaking strength of the rope. The ropes shall be standard size, of sufficient length to provide for the specified lift, plus fill three (3) extra wraps on the drum and an adequate length for bitter end connection to the drum. Suitable bolt-on rope clamps shall attach the ropes to the circumference of the drum. Where ropes dead end other than on the drum, the rope attachment shall develop the full strength of the rope. As a minimum, rope shall be extra improved plow steel (EIPS) independent wire core (IWRC), type 6x37 strand. For ease of replacement, rope with a diameter greater than 1.25 inch shall not be used. No reverse bends in the reeving system will be permitted.
- J. Miscellaneous Machinery
  1. Gearing and Speed Reducers: All gear reductions shall be contained in enclosed housing, except the final reduction (pinion) on the main hoist unit which may be external to the speed reducer. If this arrangement is used it shall be fully guarded and provided with a means of lubrication. Gears in speed reducers shall be finished to AGMA No. 8 or higher. Gears for final reductions shall be of the spur or helical type. All gearing and speed reducers shall be designed and rated in accordance with the applicable AGMA standards.
  2. Gears: The gear reducers shall be rated in accordance with AGMA standards. The design of gears for built-up speed reducers shall be in accordance with the requirements of CMAA No. 70 for class F service. The rating of commercial speed reducers shall be based either on the AGMA catalog rating of the speed



reducer with a 1.5 service factor applied or the crane manufacturers calculated durability and strength rating of the gears. If the rating is based on the durability and strength rating of the gears, the design of the gears shall be in accordance with the requirements of CMAA No. 70 for class F service, and the manufacturer shall submit gear design analysis in accordance with AGMA standards for approval. All hoisting gearing shall be of the spur or helical type, machine cut from rolled or forged steel in accordance with Article 4.7 of CMAA No. 70. Overhung gears or pinions will not be permitted except for the rotate drive pinion. Pinions shall be forged integral with the shaft where practicable. Gears shall be pressed or shrunk fit on the shaft. Welding of defective gear teeth will not be permitted. All gearing shall be fully guarded and provided with a means of lubrication.

3. Speed Reducers: Speed reducers may be a standard catalog product of a speed reducer manufacturer (commercial speed reducer) or of special design for the specific application (built-up speed reducer). Speed reducers shall be entirely self-contained in an oil-tight, fabricated steel enclosure designed to maintain shafts and bearings in accurate alignment. Reducers shall be split along the gear line for ease of maintenance. All bearings shall be self-aligning, heavy-duty, anti-friction, roller type. Bearing caps/retainers shall be provided on all bearings to permit inspection. All high-speed gearing shall operate in an oil bath. Oil level gauges shall be provided and be conveniently located for observation by operating personnel. Provisions for draining and ventilation of each speed reducer shall be made. Speed reducers shall be securely fitted in place.
4. Gear Cases: All gears shall be enclosed in oil tight cases unless otherwise specified. The cases shall be provided with seals compatible with the recommended lubricant, drain plugs, breathers, oil level dipstick or sight glass, lifting lugs, and an oil tight inspection cover which can be removed for inspection of the gears. Gear cases shall be provided with means of cleaning and draining without dismantling the equipment. Drain plugs shall be accessible and, where necessary, shall be piped to convenient locations for collection. Gear cases shall be of welded steel plate construction and shall be sufficiently rigid to maintain proper alignment of the gearing under all load conditions. Gear cases shall be vertically or horizontally split along the gear line. Bearings shall be mounted in machined surfaces, with removable bearing retainers for inspection. Each gear case shall be provided with a strip heater.
5. External Gears: If external gears and pinions are provided for final hoist reduction, they shall either be enclosed in a housing and oil or grease lubricated, or enclosed by safety guards provided with suitable openings with covers for inspection and access for grease lubrication.
6. Bearings: Except where otherwise specified, bearings shall be of the tapered roller or ball type. Bearings shall be designed for easy replacement and shall

be placed as close as practical to the points of loading. All pillow blocks shall be mounted to solid bases and securely bolted and doweled in place.

- a. Antifriction bearings shall be of standard types most suitable for the respective application and shall have both inner and outer races. Ball and roller bearings shall conform to the applicable requirements of the ABMA 9 and ABMA 11. The manufacturer's published ratings shall be used in determining the bearing capacity. Bearings, except as noted, shall have a minimum L-10 life of 40,000 hours for CMAA No. 70 class F service, and shall be designed for the loads and speeds resulting from the specified crane performance.
  - b. For wheel bearings, half of the total wheel load shall be applied to each bearing. Wheel bearings shall also be sized for the thrust loads as specified by CMAA No 70. Wheel bearings shall be designed for axial loads of not less than 15 percent of the radial wheel load. Bearings shall have oil tight enclosures and shall have synthetic rubber, spring-loaded element to retain the grease and another synthetic rubber element to exclude foreign matter.
- K. Couplings: Flexible couplings shall be of the gear type and have a sufficient capacity to develop the full strength of the shafting that they connect. Flexible couplings shall be pressed and keyed. Couplings with sleeves held in place or retained by snap rings will not be permitted. A flexible coupling shall be provided at each motor that is not flange mounted to the reducer. Rigid steel plate guards shall be provided for all couplings, and be removable for maintenance.
- L. Lubrication
1. The cranes shall be provided with an automatic central lubrication system to lubricate all components that normally require lubrication. The system shall be equipped with an alarm to signal when replacement of lubrication is required.
  2. An automatic centralized lubrication system shall be provided in the trolley house for the main machinery and sheaves. A central lubrication system shall also be provided at each leg or bottom sill for all trucks and component fittings requiring lubrication.
  3. Oil lubrication shall be provided for gear trains, gear-type couplings, and speed reducers except that grease lubrication will be acceptable for drum gears and the final gear drive on the trolley and gantry wheels.
  4. Lubrication for other mechanical operating parts which are not automatically lubricated shall be by means of high-pressure "Alemite" or approved equal 1/8 inch button head fittings. The lubricating fittings of journals or bearings shall be readily accessible, and where necessary, shall be piped to convenient points

using copper or brass pipe of ample size, adequately fastened with grommets and clamps to prevent vibration during gantry operations.

5. Drain and fill plugs of speed reducers and gear cases shall be located so as to be readily accessible and shall be provided with extension piping where required. The speed reducers shall have pressure relief valves as recommended by the manufacturer for outdoor service.
6. Lubricating oil for speed reducers and gear couplings shall have good resistance to foaming under normal operating conditions and shall be non-corrosive to speed reducer components. The oil shall have a pour point of -20 degrees F or lower and shall be suitable for infrequent intermittent duty operation of the speed reducers within an ambient temperature range from -20 degrees F to 120 degrees F. The oil shall be in accordance with the recommendation of the manufacturer of the speed reducers for the temperature specified.
7. A list of recommended lubricants for the crane, spreader and other components requiring lubrication shall be provided.

M. Head Block Assembly

1. The hoisting wire rope cables unit shall be reeved through sheaves mounted to a head block assembly, and attached to the container spreader.
2. Standard ISO twistlocks shall be provided for securing the head block to the spreader and proof tested at twice their normal rated loading, plus a 25 percent impact factor.

N. Spreader

1. Each crane shall be provided with an electric operated 30 short ton (SWL) lifting heavy duty single lift spreader to handle 20 foot long x 12 foot high x 8.5 foot wide container.
2. The spreaders shall be furnished with twistlock sockets and interfaced with the crane head block to expedite replacement if required
3. The spreaders shall contain automatic flippers at each corner designed to actuate individually or in tandem for spotting containers onto the shuttle car on the pier and through the barge cell guides. The flippers shall be designed for the 8.50 ft wide container. The total width of the flippers shall not exceed 9.0 inches and the length shall not exceed 2.0 ft when engaged and positioned over the container. The depth of the flippers shall be as short as practical without reducing their alignment capability.

4. The spreaders shall be equipped with a longitudinal side shift feature of 12 inches in each direction to compensate for misalignment of the container into the cell guides, onto the shuttle car and for stacking containers on the pier.
5. The spreaders shall be provided with automatic twistlocks, audible alarms and visual signals and to assist operation from the operator's cab.
6. The locations of the twist locks shall comply with ISO standards for handling a 20 foot standard container with dimensions and tolerances as shown on the Contract Drawings.
7. The spreaders shall be provided with a height indication system to sense the container approach and prevent impact noise. Logic shall be interfaced with crane management system.
8. The spreaders shall be furnished with and impact noise reduction for reduced noise and improved performance.
9. The spreaders shall be furnished with an automated operating, diagnostic and monitoring system integrated into the crane management system.
10. For safety, an electrical interlock shall provided to prevent spreaders from operating the flippers when passing through the cranes legs (portals).
11. Miscellaneous
  - a. AC power and control signals shall be routed from the cranes headblock to the spreader power unit via a "Pyle" or approved equal, heavy duty, rectangular 37 pin, #12 AWG connector with 3 foot pigtail.
  - b. All electric components necessary for the proper operation of the spreader (such as solenoids, limit switches, etc.) shall be included in the spreader manufacture's scope of supply.
  - c. Four (4) lifting lugs, each rated for 10 tons lift, shall be located on the inside frame for lifting miscellaneous loads.

## 2.07 CONTAINER GANTRY CRANE ELECTRICAL EQUIPMENT AND COMPONENTS

### A. General Features

1. The City will supply actual voltage at the runway conductor supply taps not more than 105 percent and not less than 96 percent of the nominal system voltage. The crane supplier shall define the requirements of the runway conductor system to achieve an input voltage not less than 93 percent of the nominal system voltage to the crane at the point of conductor reach farthest from the runway conductor supply taps.

2. Electric power supplied to the cranes shall be 480-volt, 3-phase, 60-cycle, provided through an electrical conductor bar system "Hevi-Bar II" manufactured by "Insul-8" or approved equal. The Drawings shall be used as guidance for furnishing material and installation. Isolation conductor bar sections shall be provided at each end for crane maintenance in their parked positions as indicated on the Contract Drawings.
3. Mechanical or electronic slow down and stop limit switch cams or targets for gantry travel shall be provided and installed at each end of the piers as shown on the Drawings. The Drawings shall be used as guidance for the installation. Switches or targets shall be positioned on the cranes for ease of installation and maintenance. The cams shall be mounted from the conductor rail supports as shown on the Contract Drawings. Final adjustments shall be made during field testing of cranes.
4. Spreader lighting shall be provided for night time operation in accordance with Section 16511 – Lighting.
5. CCTV cameras shall be installed over corners of gantry legs as shown on the Drawings. CCTV monitor to barge cell View crane rails while crane is in operation.
6. Load scale and slack cable (wire rope) device with audible alarms and interlock system shall be provided for hoist overload conditions.
7. An anemometer to monitor wind speed shall be provided. A warning signal shall activate when the adjusted wind speed limit is obtained. An override switch shall also be included in the system. The actual speed and the warning signal shall be displayed in the operator's cab.
8. An intercom system shall be installed in the cab, for communication to the trolley house and loudspeaker announcements to the pier. A microphone for external communication (public address system) shall be provided, with a knee-activator, to communicate with the ground personnel through a loudspeaker mounted on the gantry.
9. Audible alarms/bells shall be provided with manual cutoff switches to override/prevent continuous annunciation when gantry is in motion.
10. Warning devices (visual and audible) for trolley house overtemperature, fire, operator signaling and wind speed.

B. Electrical equipment and components shall comply with the following requirements:

1. General

- a. The electrical equipment section of this specification is intended to cover a floor or dock running, box girder construction, gantry type, traveling crane for operation with an alternating current power supply. All wet or weather-exposed areas of the crane shall be designated Corrosive Areas as per Section 16050 - Basic Electrical Materials and Methods.
- b. The proposal of the crane manufacturer shall include the rating and description of all motors, brakes, control, protective, and safety features
- c. The crane manufacturer shall furnish and mount all electrical equipment, conduit and wiring, unless otherwise specified. If it is necessary to partially disassemble the crane for shipment, all conduit and wiring affected shall be cut to length and identified to facilitate re-assembly.
- d. Wiring and equipment shall comply with Article 610 of the National Electrical Code (NEC).
- e. Electrical components shall be designed and rated in accordance with applicable NEMA or UL standards. Refer to Division 1 - General Requirements for applicable regulatory requirements and for submittals using equivalent materials and equipment. All electrical components used shall be readily available from third party distributors and electrical wholesalers located in the Eastern United States.
- f. Electrical equipment shall comply with ANSI/ASME B30.2 Safety Standard for Overhead and Gantry Cranes.
- g. Wiring conductor sizes shall be chosen to limit voltage drop, from the runway power supply pickup shoes to any load, to 2 percent or less.
- h. Protective devices shall be selected to provide best practicable coordination with the plant feeder circuit breaker, and with any upstream crane electrical protective devices.

2. Digital Controls

- a. General: Provide variable speed, solid state AC drives for hoist, trolley, and gantry motions, which include the following features.
- b. Four quadrant (regenerative) operation features shall be provided for all crane motions. Controllers shall be arranged to feed regenerated power back into the AC power lines.

- c. Load dependent frequency increase. Allows maximum hoist speed to increase when less than full rated load is being lifted or lowered by the spreader or lifting beam.
- d. Precise hoist brake control. Motor torque is accurately monitored to eliminate load sagging due to insufficient hoisting torque being developed prior to hoist brake release.
- e. Hoist motor torque providing proving prior to brake release
- f. Oversized for continuous starting and stopping
- g. Drive shall require no jumpers or potentiometers for set-up
- h. Totally modular designs
- i. Diagnostic software
- j. Interchangeable (converter) operator control panels for parameter adjustment
- k. Alphanumeric read out displayed in English language
- l. Torque limitation settings up to 200 percent of full load motor torque
- m. Overload rating of 150 percent of full load motor torque for 60 seconds
- n. Line reactor
- o. Encoder feedback for precise hoist speed control and operation above base speed
- p. Control circuit interface boards
- q. Brake contactors
- r. NEMA 12 control enclosures in the control house
- s. Hoist brake sensing to "constantly" monitor brake for slippage
- t. Hoist load (current) limited for hoisting direction only. Lowering direction "NOT" load limited.
- u. Main Hoist enclosure space heater, with 40-80 degree F thermostat
- v. Drive enclosure space heaters, with manual ON-OFF switch, 40-80 degree F thermostat and SPACE HEATER ON indicator light.

- w. All drive enclosures shall be equipped with cooling fans where needed to extract excessive heat. Harmonic currents imposed on the power supply shall be suppressed in accordance with IEEE Std. 519. Harmonic filtering and power factor correction shall be used to ensure compliance with requirements of the local utility.
- x. Additionally, the AC digital drives for all motions shall be modular and be compatible with each other as follows:
  - 1. Identical software platforms
  - 2. Identical operator interfaces
  - 3. Identical control cards
  - 4. Identical option cards
  - 5. Identical card racks
- 3. Electrical panel specifications: The crane manufacturer shall comply with the following electrical panel wiring specifications:
  - a. Front wired control panels
  - b. Logically grouped components
  - c. Fine-stranded type SIS panel wire
  - d. Panel wiring in wiring ducts or neatly wrapped groups
  - e. Each wire labeled at each termination point
  - f. Separation between power/control wiring and signal wiring
  - g. Panel front doors shall be to be hinged with extra-flexible wiring provided around each hinge
  - h. Minimum 12 gauge power wiring and 18 gauge control wiring
  - i. Insulation rated 195 degrees F minimum, ambient temperature to be considered to be 104 degrees F
  - j. No splices
  - k. Heat shrink tubing to prevent grounds on shielded cable ends
  - l. Terminal blocks for external wiring
  - m. All components in panels shall be labeled using engraved phenolic or approved equal label plates. Labels are mounted on the panel (not on the



device) for easy identification; labels match the component identifiers on electrical drawings. Label plates shall be screw mounted.

- n. Power resistors in separate enclosures with fine-stranded high-temperature type SRML wire
  - o. All devices and wire bundles secured with screws or bolts; no self-adhesive tie downs used
  - p. Logical conduit layout relative to motors, brakes, limit switches, and other electrical components for ease of maintenance
  - q. Corrosion resistant fasteners and fittings. Steel panels shall be protected by corrosion resistant primer and paint system
  - r. Shock absorbing light mounting designed for easy bulb replacement
4. Motors
- a. Refer to Section 16220 - Electric Motors and Section 16445 - Motor Control Centers.
  - b. Main drive motors shall be 460 volt, AC squirrel cage with class H insulation, rated for inverter use.
  - c. Main Hoist motor shall be DPG-FV (Drip Proof Guarded, Force-Ventilated), and rated for Continuous duty. Trolley and gantry motors shall be rated for Continuous duty.
  - d. Main Hoist motor shall be equipped with a continuously running blower motor with space heater. Main hoist, trolley and gantry motors shall be provided with space heaters.
  - e. Motors shall be provided with anti-friction ball bearings.
  - f. The space heater circuit, for each motor equipped with space heaters, shall have a manual ON-OFF switch and SPACE HEATER ON indicator light and shall be interlocked with its associated motor starter so that the space heater circuit is energized at all times except when the corresponding mainline contactor is energized, the manual switch is in the OFF position or the entire crane supply circuit is de-energized.
  - g. Provide thermal overload protection with automatic reset for all drive motors.
  - h. Motors shall be capable of accelerating and running with rated hook load with voltages up to and including 110 percent of the rated values of the

selected adjustable voltage power supply. For power supplies, AC line voltage variation shall be between plus or minus 10 percent of rated voltage.

- i. All secondary AC drive motors (for hydraulic power, spreader rotation, etc) shall be rated 460 volts, 3-phase, 60 hertz. The rating shall not be less than 60 minutes, nor less than continuous for HVAC, blower and pump motors. All motors shall be designed to operate for the time rating indicated at design ambient temperatures. Space heaters shall be furnished for all motors.
  - j. Horsepower Calculation
    - 1. Hoist mechanical horsepower shall be calculated per Section 5.2.9.1.1.1 of CMAA No. 70.
    - 2. Required hoist horsepower equals the mechanical horsepower times a control factor (Kc). Control factor for power supplies rectified on the crane for use with magnetic or static control systems shall be determined by consultation with the motor and control manufacturers.
  - k. Gantry/Trolley Horsepower Calculation
    - 1. Gantry and trolley horsepower shall be calculated for outdoor conditions as specified in Section 5.2.9.1.2 of CMAA No. 70 with a pressure due to a "typical" 35 mph wind, a friction factor of 12 lbs per ton, and a service class factor of 1.2. Wind force = 0.00256 times the wind speed, in miles per hour, squared (see CMAA No. 70). Controls shall also provide for operation in the occasional 45 mph head wind, while overloaded, as allowed per CMAA No. 70.
    - 2. Suitable allowance shall be included for winter snow and ice loading.
5. Brakes
- a. General: Brakes shall be selected and rated in accordance with Section 4.9 of CMAA No. 70 as a minimum unless specified otherwise herein.
  - b. Magnetic holding brakes shall be of the electric released spring set type (shoe or disc as specified), attached to the motor or reducer high-speed shaft. Brakes shall be readily adjustable and equally effective in both directions. Brakes shall provide smooth, predictable operation throughout the entire range of the respective crane motions they are applied to.
  - c. The main hoist drive shall be provided with an electric shoe holding brake sized for 150 percent of the full load motor torque and be capable of holding the rated load without downward drift irrespective of electrical

component failure or power failure including loss of phase. Brake shall have conduit connection box, corrosion resistant pins, and manual release. Brakes mounted on the motor may be connected through the motor connection box.

- d. The gantry and trolley drives shall be provided with a Pintch-Bamag or approved equal, waterproof enclosed, disc type electric holding brakes, flange mounted to the accessory end of the motor. Disc brakes for the gantry and trolley shall be sized for 100 percent of the full load motor torque, with thermal capacity sufficient to allow for two consecutive emergency stops with full load and an adverse operating wind, and shall not cause wheel slip upon setting. Brakes shall be capable of stopping as required by CMAA No. 70. All brakes shall be provided with a space heater, and a manual release lever.
  - e. Holding brakes shall be applied automatically when power to the brake is removed. All brakes shall be released only when sufficient electric power is applied to the brake coil through the motor circuit on command from the operator's master switch. All brakes shall be provided with a brake release limit switch, to indicate brake condition.
  - f. Select coil time rating for the duration and frequency of operation for the class of service specified. Traverse drive brakes used only for emergency stop on power loss, or setting by operator choice, shall have a coil rated for continuous duty.
  - g. Shoe brakes for outdoor crane locations shall be provided with an outdoor rated waterproof enclosure and space heater.
6. Protection and Safety Features
- a. A crane disconnecting means, either a current-rated circuit breaker or motor rated switch complying with the applicable requirements of Section 16411 – Disconnect Switches, lockable in the open position, shall be provided in the leads from the runway power supply.
  - b. The continuous rating of the switch or circuit breaker shall not be less than 50 percent of the combined short time motor full load currents, nor less than 75 percent of the sum of the short time load currents of the motors required for any single crane motion, plus any additional loads fed by the device.
  - c. The disconnecting means shall have an operating means located where it is readily accessible to the operator's station, or a mainline contactor connected after the device may be furnished and shall be operable from the operator's station.

- d. Power circuit fault protection devices shall be furnished in accordance with NEC Sections 110-9 Interrupting Rating and Section 16443 - Panelboards. The crane manufacturer shall state the interrupting rating being furnished.
  - e. Branch circuit protection shall be provided per NEC Section 610-42 Branch Circuit Protection and Section 16443 - Panelboards.
  - f. Magnetic mainline contactors shall be as shown in Tables 5.6.6-1 and 5.6.6-2 of CMAA No. 70. The size shall not be less than the rating of the largest primary contactor used on any one motion.
  - g. Motor running overload protection shall be provided in accordance with NEC 610-43 Motor Running Overload Protection.
  - h. Control circuits shall be protected in accordance with NEC 610-53 Over-current Protection.
  - i. Under-voltage protection (UVP) shall be provided as a function of each motor controller, or enclosed protective panel, or magnetic mainline contactor, or manual-magnetic disconnect switch.
  - j. Cab controls shall utilize spring return master switches and momentary contact push buttons where required.
7. Warning Devices
- a. Refer to Section 13851 - Fire Alarm and Detection System.
  - b. Provide two 120 VAC 10 inch gong type warning bells in weatherproof box or electronic alarm; one mounted on each gantry leg assembly. Bells shall sound whenever the crane is in motion.
  - c. An operator controlled resonating horn, with swivel base, shall be mounted on the cab.
  - d. Provide an anemometer (wind speed indicator) with viewing window, cable, and a single adjustable set point with time delay, heater, and thermostat. The readout shall be mounted in the cab. System shall sound a horn and give a visual indication of the speed to the operator. System shall be adjustable and will initially be set to trip at 45 MPH.
8. Limit Switches
- a. The hoist shall be equipped with a watertight, corrosion-resistant, Cutler-Hammer or approved equal, weight activated, over travel limit switch in the raising direction, to stop the hoisting motion when the final maximum

hoisting elevation has been reached. Activation of the control circuit switch will shut down the hoist drive. Interruption of the raising motion shall not interfere with the lowering motion.

- b. The hoist shall be equipped with a watertight, corrosion-resistant, Gemco or approved equal, geared rotary, over travel limit switch for the raising and lowering direction, to stop the hoisting and lowering motion when the maximum hoisting and lowering elevations have been reached. Activation of this control circuit switch will shut down the hoist drive. Interruption of the raising motion shall not interfere with the lowering motion and vice versa.
- c. Lower limit switch shall be provided because the spreader or headblock can be lowered beyond the normal lowest ground level set-down position when picking or depositing containers from the barges.
- d. Provide a hoist drum encoder and a trolley travel encoder to monitor position of the load. The PLC that controls the hoist shall not permit lowering of the load when the center of the load is within 10.250 ft of the waterside leg (either side), nor within 11.250 ft of the waterside of the land side leg, nor within 10.333 ft of the land side of the land side leg. This will prevent stacking of containers where there is an interference with the crane or with other equipment. The encoder and PLC shall not prevent hoisting of the load.
- e. Provide watertight, corrosion-resistant control circuit limit switches to slow down and stop the trolley or gantry motion when approaching or upon reaching the maximum end of travel position. Two limit switches will be provided for each direction of travel on the trolley and gantry. Switches shall be designed and positioned to prevent gantry trucks or trolley assembly from impacting stops at full speed. Trolley switches shall be operated by steel vanes mounted along the gantry girder, and gantry truck switches shall be operated by steel vanes mounted along side the runway power conductor rail. Switches shall be heavy duty, Cutler-Hammer or approved equal, proximity type or mechanically operated, designed for high-speed operation. Gantry end-of-travel limit switches shall be Cutler-Hammer type CB or approved equal.
- f. Provide watertight, corrosion-resistant track type limit switches to limit maximum up/down travel of the List/Trim compensation system.
- g. Provide watertight, corrosion-resistant track type limit switches, to indicate that the headblock and spreader twistlocks are fully engaged.
- h. Provide an "Unbalanced Container" indication system consisting of load cell pins in two upper running sheaves. Hoisting will be prevented when the weight readings on the load cells differ by a preset amount. Lowering

will be allowed to set down the unbalanced container. Load cells when provided shall be wired with watertight Amphenol, or approved equal, pin type connectors.

- i. Provide an overweight limit switch in the hoisting motion to stop hoisting motion upon activation of a hoist overload condition. Lowering the load shall be possible while in an overloading condition.
- j. The trip point of all limit switches shall be located to allow for maximum runout distance of the motion being stopped for the braking system being used.
- k. All directional limits shall not prevent reversing by selecting motion in the opposite direction.

#### 9. Trolley Conductor Systems

- a. Crane manufacturer shall provide a main trolley festooned conductor system with 4 wheeled festoon cars running on a minimum 4 inches high I beam track. Intermediate and tow cars shall have 4 steel wheels, side guide rollers, with stainless hardware, bumpers, and upkick rollers designed for high-speed service. Tow ropes and cable organizers shall be provided between the adjacent cars. Cars shall stack up at one end of the trolleys travel.
- b. Crane manufacturer may use a cable track (or cable chain) system in lieu of the festooned cable. Cable track shall have parts readily available from suppliers in the Eastern United States. Cable track shall be selected to have at least 10 percent unused space available for future addition cables, but not less than the space used by the largest cable installed. Cable tracks shall be amply protected from the accumulation of wind-driven snow and ice.
- c. Multi-conductor festoon or track-mounted cables shall be flexible with a neoprene outer jacket. Provide 10 percent spare conductors of each size used. The minimum wire size shall be #12 AWG for power, #14 AWG for control, and #16 AWG for instrumentation.
- d. The published intermittent ratings for the various conductors shall not be less than the ampacity required for the circuit in which they are used. Conductor continuous ratings must be adequate for continuous loads (e.g. lighting, pumps, ventilation). Conductor sizes shall be chosen to avoid excessive voltage drop.

## 10. Runway Conductor System

- a. The crane manufacturer shall provide and install a runway conductor bar system. The runway conductor system shall be an Insul-8 Hevibar II type system, or approved equal, and shall consist of four bars. The bus bars of the runway conductor system will be mounted to the transfer facility roof on brackets provided by the City. Drawings shall be used as guidance for the ordering of material and installation of the collector system.
- b. The runway conductor bar system shall be divided into three conductor bar sections. The center conductor bar section shall be capable of powering either crane. The end section at either side of the center section shall be arranged to power only the crane on that side when in the parked position. Each section shall have its own feeder and pier level disconnect switch, such that the section at either end can be de-energized to remove power to the parked crane at that end, without preventing the use of the other crane.
- c. The crane manufacturer shall provide and install the runway conductor system in accordance with Article 610 of the National Electrical Code and all applicable local codes.
- d. The bus bar shall be manufactured from extruded aluminum with a 304 stainless steel contact surface. The bus bar shall be provided with a PVC cover. All hanger clamps shall be stainless steel. All connection and mounting hardware shall be stainless steel on aluminum.
- e. The collector heads shall be of tandem design and provided in sufficient number to meet the ampacity requirements of the crane. The collector heads shall be a parallelogram type device which both articulates and swivels. Each collector head shall as a minimum have 5.5 inches of vertical travel and 5 inches of horizontal travel.
- f. The runway conductors shall have sufficient ampacity to carry the required current to the crane, when all motions are operating with the maximum rated load, while the other crane is parked with only maintenance loads in operation. The conductor ratings shall be selected in accordance with Article 610 of the National Electrical Code. The ampacities of fixed loads such as heating, air conditioning, lighting, motor blowers, transformers, etc. may be computed as 2.25 times their total which will permit the application of the intermittent ampacity ratings for use with the continuous fixed loads.
- g. The crane manufacturer shall limit the voltage drops within the crane to the motors and other electrical loads to approximately 2 percent of the nominal system voltage.

- h. All voltage drops shall be computed by using main feeder currents, individual motor currents, and fixed load currents as defined by Article 610 of the National Electrical Code.
- i. Voltage drops shall be calculated during the maximum inrush (starting) conditions to insure that the crane motor drive terminal voltages are not less than 90 percent of rated voltage, and control and brake voltages are not less than 85 percent of rated voltage.
- j. The actual operating voltages at the crane motor drive terminals shall not exceed 110 percent or not drop below 95 percent of motor ratings, for rated running conditions.
- k. A footwalk with handrails shall be provided beyond the end of the girder structure to properly access the festoon cars, or cable track, for inspection and maintenance.

#### 11. Operator Controls

- a. Crane operation shall be controlled from the trolley mounted operators cab console chair, J.R. Merritt Model FSAD, or approved equal through the use of single and dual axis master switches, push buttons, selector switches, indicator lights, and a buzzer. All control devices and indicators shall be identified by suitable nameplates wherever their function is not otherwise obvious, and suitable, dimmable nighttime illumination shall be provided.
- b. The crane cab shall be provided with master switches for Hoist, Trolley, and Gantry motion that are mounted in the operators' chair, within easy reach of the operator.
- c. Cab master switches shall be provided with a spring return arrangement latch, which in the "off" position prevents the handle from being inadvertently moved to the "on" position.
- d. Crane speeds shall be proportional to the degree of travel of the master switch handle. Master switches shall be arranged such that the crane motion is in the same relative direction as the movement of the master switch handle with the cab and cab chair facing the barge.
- e. Cab controls shall be designed to permit the operator to use two hands to control the crane.
- f. External audible and visual signals shall be activated any time the crane is in operation.



12. Cab Switches: The following functions and devices shall be incorporated into the two operator chair control consoles:
- a. Start Pushbutton: Provide a "start" push button to energize the crane's main contactor. For safety, the main contactor shall not be allowed to pick up under either of the following circumstances:
    - (1) Motion commanded: Any of the master switches are not in the "OFF" position.
    - (2) Power supply fault: The Phase Failure relay has detected an over voltage, or under voltage, or phase failure.
  - b. Stop/Reset Push Button: Provide a "stop/reset" pushbutton that will stop all crane motions. The main contactor shall open, and all brakes shall set.
  - c. Hoist Master Switch: Provide a single axis master switch to control the hoist drive from 0 to 100 percent speed in the direction of desired motion (UP, or DOWN).
  - d. Trolley/Gantry Joystick Master Switches: A joystick shall be provided for the trolley and gantry motions. This switch shall have two axes, one for the trolley and one for the gantry to control their respective drives from 0 to 100 percent speed.
  - e. Cab Horn: Provide a push-button to sound the horn. The horn shall also sound when the anemometer detects a high wind speed.
  - f. Trim/List /Skew Joystick: Provide a single speed joystick master switch which moves either the long axis of the compensation system (list) or the short axis (trim). List and trim compensation system shall each be moved in the UP or DOWN direction by the action of the master switch.
  - g. Cab Defroster: Provide an ON/OFF switch with speed selection for the cab defroster fan.
  - h. Cab Wiper: Provide an ON/OFF switch with speed selection for the cab front window wiper motor.
  - i. Cab Floodlights: Provide an ON/OFF switch for the trolley floodlights.
  - j. Spreader OFF/RUN/START: Provide switch to manually "Start" and "Stop" the hydraulic pump motor which powers all spreader functions.
  - k. Twistlocks Bypass: Twistlocks must be either locked, or unlocked. In normal operation, if neither of the above lights is on, the hoist UP motion shall not be allowed. Provide a momentary contact key switch

“Twistlocks Bypass” to allow maintenance personnel to bypass this safety feature.

- l. Twistlocks Man/Auto: Provide a selector switch to choose between “Manual” and “Auto” modes.
- m. Twistlocks Unlock/Lock: Provide a “Lock”/“Unlock” selector switch that operates as follows in the manual mode, and the auto mode:
  - (1) Manual Mode: Move the switch to “Lock” to move the twistlocks in the lock direction. Move the switch to “Unlock” to move the twistlocks in the unlock direction.
  - (2) Auto Mode: Twistlocks will automatically move to the fully locked position when “container seated” is sensed. Twistlocks will automatically move to the fully unlocked position when “UNLOCK” is briefly selected.

### 13. Cab Chair Indicator Lights

- a. Power Available Light: Provide a green “Power Available” light that will turn on when 120VAC power is available at the control console.
- b. Power On Light: Provide a red “Power On” light that will turn on when the Main contactor has energized.
- c. Gantry Electrical Control Room Overtemp: Provide amber light that will turn on if a high temperature is detected in the electrical control room. The main contactor shall drop out, and will not be allowed to re-energize until the over temperature is no longer detected.
- d. Rotation End Of Travel Light: This red light will turn on to indicate the condition that the skew end-of-travel limits have tripped.
- e. Unstable Load Light: It shall be possible to lift a container, which meets the criteria for size, and center of gravity, only if the container is somewhat in line with the long axis of the head block. If a container is too far out of line when the attempt to lift occurs, one end will not lift off of the ground, and the other will go high into the air. It is assumed that the operator will notice this problem, and stop hoisting. An unstable load sensing system shall be provided to sense potential problems. Two load cells shall be installed in the load sheaves to detect a minimum load. If minimum load is not detected in either load cell, the “unstable load light” will turn on, and rotation will be disabled in the last commanded direction.

- f. The red "Unstable Load" light will turn on under the following circumstances:
  - (1) The spreader is not being lifted by the head block: The weight of the spreader is necessary to cause the minimum loading that the unstable load sensor is looking for. If the spreader is not on the head block, or is on the ground, the unstable load light will be on. Note: The light may be ignored in this circumstance.
  - (2) A container is lifted while its long axis is in line with the head blocks long axis: When an unevenly loaded container is rotated, it can be unbalanced in either direction and can approach an unstable configuration. When the unstable load is detected, rotation in that direction is stopped, and only rotation in the other (stable) direction is allowed.
- g. Container Seated: Provide an amber "Container Seated" light that will turn on when all four container seated limit switches on the spreader indicate that the container is properly seated.
- h. Twistlocks Unlocked: Provide a green "Twistlocks Unlocked" light that will turn on when both twistlock limit switches indicate that the twistlocks are unlocked.
- i. Twistlocks Locked: Provide a red "Twistlocks Locked" light that will turn on when both spreader twistlock limit switches indicate that the container twistlocks are locked.
- j. Collision Avoidance System Activated: Provide flashing amber light that will turn on when the crane approaches the bumper or other crane. The light will continue to flash until the crane has reversed direction or the crane is no longer in the collision avoidance zone.
- k. Hoist Overload: Provide flashing red light that will activate when an overload has been sensed.
- l. Limit switch actuated indicators for limit switches on main hoist, trolley travel or gantry travel. These may be omitted if condition is indicated on alphanumeric display at operator's position.
- m. Hoist Lower Prohibited indicator light when hoist lower is selected in encoder-generated lower-prohibit zones. This may be omitted if condition is indicated on alphanumeric display at operator's position.

## 14. Interlocks

- a. Hoist Interlock - Twistlocks Good: Provide a "twistlocks good" circuit to prevent the hoist from lifting under the following circumstances:
  - (1) The spreader is connected, but the head block twistlocks are not fully locked.
  - (2) The spreader twistlocks are not fully locked, or unlocked.
- b. Hoist Interlock - List/Trim: The List/Trim limits shall also cancel hoist motion in the UP direction. This interlocking shall prevent damage to the head block bearing should the operator attempt to lift a container that is frozen to the ground. This condition could cause uneven rope tension, resulting in excessive stress on the head block bearing. All directional limits may be backed out of by selecting motion in the opposite direction.
- c. Hoist Interlock - List/Trim Limit Lights: Provide a red light that will turn on to indicate that the list/trim end of travel limits have tripped. These limits shall also cancel hoist motion in the UP direction.
- d. Crane Anti-Collision: Sensors shall be provided on each crane to sense the location of either the other crane or the fixed bumpers on the end of the runway. When the moving crane is approaching either the stopped crane or the fixed bumpers, the system shall automatically slow the moving crane to a minimum speed as well as provide a visual indication to the operator that the cranes are approaching an obstacle. The anti-collision system shall allow contact with either the other crane or the fixed bumpers at minimum speed to allow the full use of the runway. Movement in the opposite direction shall restore the full speed capability to the crane. If practicable, the anti-collision detectors shall be mounted to detect other obstacles by interruption of the detection beam. The anti-collision system shall be Torq Hoist Laser Guard or an approved equal.

## 15. Electrical Equipment--Additional Requirements

- a. Motors shall be designed specifically for crane and hoist duty and shall conform to the NEMA MG-1 Standard or AISE Standards No. 1 or 1A, where applicable. Motors shall be procured from domestic suppliers to assure availability of replacements. Acceptable motor manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - (1) General Electric
  - (2) Marathon
  - (3) Reliance

- (4) Reuland
  - (5) Siemens
  - (6) Or approved equal
- b. Float switches, limit switches and other mechanically actuated electrical devices shall consist of an approved electrical system housed in rugged metal enclosures. They shall be adjustable without disturbing conduit connections. The switch actuating mechanism shall be mechanically and structurally suitable for the required service and shall not subject the electrical parts to unnecessary stress or mechanical shock. Operating shafts shall be bushed and stuffed in dust-tight cases.
- c. Electrical equipment rated greater than 1,000 watts and lighting equipment greater than 15 watts with an inductive reactance load component, shall have a power factor of not less than 85 percent under rated load conditions. Electrical equipment with a power factor less than 85 percent shall be corrected to at least 85 percent under rated load conditions. Installed power factor corrective devices shall be switched with utilization equipment.
- d. Wire terminals on manufactured assemblies such as switchboards, bench boards, control panels, alarm boards, and motor control equipment shall consist of cup terminals, pronged washers, compression type solderless connectors or pressure type terminals furnished on devices.
- e. All control and indication wires within switchboards, control centers and other panels and cabinets shall be terminated on terminal blocks provided with marking strips for wire designation. The manufacturer shall identify all wires on the marking strips. All field wires will be terminated and identified.
- f. Wire and cables installed at the plant site to be terminated with approved solderless copper alloy lugs. Lugs may be of the compression type, clamp type or screw type with internal pressure bar, or may be pressure tool applied solderless connectors. Pressure tool applied solderless connectors for wires 250 MCM or larger shall have long barrels to allow double indentation. Where clamp type or screw type lugs are installed on wires 1/0 AWG and larger, wire ends shall be filled with solder, contact surfaces of lugs shall be tinned and heat shall be applied when the lugs are tightened.
- g. Motor control equipment shall provide undervoltage and overload protection for all motors. Reference Section 16445 for applicable requirements.
- h. All motor and control terminals, upon which field connected circuits are to be terminated, shall be clearly and permanently identified. Terminal

identification shall correspond with that indicated on schematic wiring diagrams.

- i. Electrical design and installations shall be in accordance with the requirements of NEC Article 610, ANSI, NEMA, NFPA 70 standards, and with applicable state and local codes. Electrical components shall be shipped pre-wired to the greatest extent practical. Wiring diagrams and tagged cables shall be provided for all items to be wired at the site.
- j. The crane shall be furnished and installed with a source junction box that complies with outdoor requirements.
- k. A circuit breaker panel board shall be provided in the trolley house and located for ease of access. The panel board shall contain a circuit breaker for the main power supply and branch circuit breakers for each of the motors and auxiliary equipment and shall be rated for the required duty. Reference Section 16443 - Panelboards for applicable requirements. Approximately 10 percent (at least two (2)) spare circuit breakers shall be provided for future use.
- l. Motors, controls, and other electrical devices shall be directly connected to the grounding system with soft-drawn copper wire. Grounding through enclosures and frames shall not be permitted. Reference Section 16060 for applicable requirements.
- m. A manual magnetic disconnect switch shall be provided in the control house. The switch shall be operable by handle at the control panel or remotely from the operators cab. The main disconnect switch shall be capable of being padlocked in the "off" position. Reference Section 16411 - Disconnect Switches for applicable requirements.
- n. Transient voltage surge suppression (TVSS) shall be provided for the power input connections at the disconnect switch, or at the main circuit breaker panelboard. The TVSS shall comply with the requirements in Section 16445 - Motor Control Centers TVSS shall be provided for motor conductors to motors located outside the trolley house. The TVSS shall comply with the requirements in Section 16445 Motor Control Centers.
- o. Cable baskets shall be furnished on the headblock to facilitate the payout and retrieval of the power and control cables, which span between the trolley and the headblock. The baskets shall have ample capacity to store the total length of extra flexible multi-conductor cable as required for the various spreader motions. Siemens Spreaderflex or approved equal, cables shall be fitted. Cables shall be round, extra flexible, multi conductor cable with lead beads.

- p. Three (3)- 120 VAC, 20 amp outlets shall be installed for general use: one (1) each in the gantry, main hoist, and trolley control enclosures.

## 16. Lighting System

- a. Refer to Section 16511 - Lighting.
- b. The cranes shall be supplied with a permanent lighting system to cover the crane work areas, ladders, walkways, and maintenance platforms. Lighting fixtures (see following listing) shall be a combination of high intensity discharge (HID) type floodlights using either high pressure sodium (HPS) or metal-halide lamps, and fluorescent or incandescent lights, and shall be designed for outdoor crane service. Lighting fixtures shall be waterproof marine type, selected and mounted for best resistance to weather and corrosion. As a minimum, the following lighting shall be provided:
  - (1) 4 - 1000 watt HID floodlights with lamp, reflector, ballast and vibration isolation mounting along the gantry foot walks.
  - (2) 2 - 1000 watt HID floodlights with lamp, reflector, ballast, and vibration isolation mounting on the trolley.
  - (3) 3 - 1000 watt HID floodlights with lamp, reflector, ballast and vibration isolation mounting on each waterside leg. Compact fluorescent lighting for access ladders, walkways, trolley and cab access. Fluorescent and incandescent lighting for Control House and Operator Cab interior lighting. Additional lights as may be needed for nighttime access, operation or maintenance.
  - (4) Supplementary lighting, if needed, to produce the following target lighting levels:
    - (a) Container handling areas under trolley: 200 lux (20 fc)
    - (b) Areas around crane: 50 lux (5 fc)
    - (c) Inside the Control House: 200 lux (20 fc)
    - (d) Inside the Cab: 100 lux (10 fc)
- c. Lights shall be shock resistant and shall be located to provide for ease of replacement of bulbs from the ladders, walkways, and maintenance platforms. Access, foot-walk, ladder and interior lighting fixtures shall be provided with guards.
- d. Lighting must be designed and installed such that bulbs and reflectors are not visible from off of the property and light scatter in the vicinity of the plant is minimal. This requires that light fixtures be hooded and directed downward.

- e. Provide lighting transformers, as required, for 208 and 120-volt flood and area lighting. Refer to Section 16460 - General Purpose Dry Type Transformers. Provide a circuit breaker panelboard for protection of the lighting system. Refer to Section 16443 - Panelboards. If lighting contactors are used to control floodlights or other lighting, refer to Section 16491 - Control Components and Devices for applicable requirements.
- f. Receptacles - Provide 120 volt, 20 amp, weatherproof receptacles on the gantry crane as follows:
  - (1) Three (3) walkway outlets mounted along the girder footwalk
  - (2) Four (4) gantry leg outlets mounted near ground level; 1 at each end of span
  - (3) Two (2) cab mounted outlets
  - (4) One (1) trolley mounted outlet
  - 5) One (1) mounted near the runway collector system and end-of-travel limit switches.
- g. Light Switches - Provide outdoor rated light switches as follows:
  - (1) One (1) 3-way switch mounted at the bottom of the boarding ladder
  - (2) One (1) 3-way switch mounted on the trolley.
  - (3) One (1) 4-way switch mounted at the top of the boarding ladder.
  - (4) Two (2) 3-way switches (for access lighting to the cab) mounted at each end of the access.
  - (5) One (1) switch inside the cab (for overhead illumination).
  - (6) One (1) switch at each entrance to the Trolley House (for interior lights).
  - (7) Switches or remote ON-OFF controls in the operator's cab for:
    - (a) Trolley floodlights
    - (b) Gantry floodlights
    - (c) Leg floodlights



## 17. Equipment Requirements

- a. All junction boxes exposed to weather shall be outdoor rated, stainless steel construction, with steel back plates, to mount Allen Bradley or approved equal terminal strips (tubular screw type with pressure plate).
- b. Electrical power furnished for crane controls shall be nominal 120 volt AC. Provide step down transformers to convert voltages as necessary for controls, space heaters, and auxiliary equipment. Refer to Section 16460 – General Purpose Dry Type Transformers.
- c. Crane motor controls shall be mounted inside of an air-conditioned, heated, and well lighted trolley house. The trolley house air conditioner shall be a self contained, roof mounted, air cooled unit with a minimum cooling capacity of 18,000 BTUH, using R134a refrigerant, and provided with a remote pilot control, cool-fan-off switch, thermostat, integral control enclosure, aluminum fin/copper tube coil, receiver and dual pressure control. The trolley house shall have a unit heater capable of keeping the house above 50 degrees F when the crane is parked. The horizontal distance in front of the surface of any control enclosure door to the nearest metallic or other trolley house obstruction shall be a minimum of 30 inches.

## 18. CCTV System

- a. Provide a CCTV system to permit the crane operator to see any obstacles on the pier rails, behind containers that may be stacked on the pier. A solid-state, color, pan-tilt-zoom (PTZ) camera shall be located at each leg to scan the rail in the direction of forward travel of that leg. The cameras shall be mounted on pivoting arms attached to the safety handrails for the crane foot-walks, locked in place outboard of the foot-walks, but arranged to be pivoted inboard for easy maintenance. The four cameras shall be in weather-tight pressurized, sealed enclosures, with heater and cooling as recommended by the manufacturer for all-weather use. A color monitor, 14 inch minimum display size, and a switcher-PTZ controller with quad display capability shall be mounted in the cab, arranged for visibility by the operator. Refer to Section 16752 - Digital Video System. In addition to the above, a separate CCTV camera and monitor shall be provided for the crane operator to view the waterside and barge at the pier. The camera shall be located under the cab facing the waterside. The camera/monitor shall become active when the joystick is positioned to move the trolley toward the waterside.

## 19. Communication System

- a. Cab to Pier Communication System: A microphone, public address amplifier and loudspeaker shall be provided for communication to ground personnel. A knee-activator shall be provided for operator control of this system. Space and power shall be provided in the operators cab for a City supplied radio communications system. Refer to Section 16741 - Paging System.
- b. Cab to Trolley House Communication System: Provide an intercom for communication between the operator's cab and the trolley house for use during maintenance and trouble-shooting. The intercom may be integrated with the loudspeaker mounted on the bottom of the cab. Refer to Section 16741 - Paging System.
- c. UHF Antenna System: Provide UHF antennas both outside and inside the trolley house, connected to allow use of the facility UHF handheld radio system from inside the trolley house. Refer to Section 16742 - Radio Communications System.

## 20. Crane Management System (CMS): The crane shall be equipped with a computer based Crane Management System. This system shall operate on an industrial grade personal computer (PC) using a current Microsoft Windows operating system. The system shall be capable of interfacing with the PLC(s) for the crane drives and with other sensors, and shall be capable of:

- a. Storing data to track and store all operator crane commands during operation for a period of one (1) week.
- b. Monitoring crane machinery and position
- c. Monitoring the crane operating cycles
- d. Monitoring containers handled and providing production reports
- e. Displaying crane status
- f. Displaying and tracking faults
- g. Providing historic trend analysis
- h. Tracking preventative maintenance schedules
- i. Tracking maintenance performed and printing maintenance reports
- j. Displaying and printing crane diagrams and schematics

- k. Other sensors and systems shall be interfaced by the CMS, including:
  - (1) wind speed indicator and alarm sensor
  - (2) trolley house ambient temperature sensor
  - (3) fire detection system (faults and fire detection)
  - (4) collision detector system (faults and collision detection)
  - (5) status and faults for the trolley house and operator's cab HVAC systems
- l. The PLC(s) for the crane drives shall accommodate the crane management system.
- m. A remote video display and keyboard/trackball control shall be provided in the operator's cab.
- n. All collected and stored CMS data shall be transmitted via radio LAN system to a Windows operated PC located at the Operations Room in the building. Real time of movements, alarms, production and maintenance data shall be available instantaneously.
- o. The Operations Room equipment for the radio LAN and Operations Room PC shall be provided with the cranes for each site.
- p. The CMS and radio LAN equipment in the crane trolley house shall be powered from a UPS.
- q. The control room equipment for the radio LAN and control room PC shall be provided with the cranes for each site.
- r. The CMS and radio LAN equipment in the crane trolley house shall be powered from a UPS.

## 2.08 CRANE ACCESS

- A. All crane access features shall comply with OSHA requirements for safety, as a minimum. Access to the bridge girder shall be via permanent ladders and attached to gantry legs. The full length of bridge girder and trolley shall be accessible via permanent walkways. Ladders shall be arranged on the land side leg of the opposite cranes as shown on the Drawings. Walkways, handrail, caged ladders, platforms and other access features shall be provided to allow access to motors, brakes and other components requiring maintenance. All access ladders and platforms shall be as shown on the Drawings and within the crane clearance

envelope. Access to all structural and field joints shall be provided to permit periodic inspection.

- B. Walkway platform and ladder lights, bridge girder floodlights, shall be as shown on the Drawings.
- C. A one-man personnel elevator shall be installed on the land side leg as shown on the Drawing. The elevator shall be positioned such that it does not interfere with the crane ladder. The elevator shall be located such that it will not extend beyond the clearance envelope (36 feet) between bumpers at the base of the gantry. The elevator shall be in accordance with the Safety Code for Elevators and Escalators, ASME A17.1-2010/CSA B44-10.

## 2.09 COATINGS

### A. Coating/Painting

1. The crane and spreader shall be painted with a three (3) part Zinc epoxy painting system as specified herein.
2. The crane structure shall be painted with a color identical to "Benjamin Moore 2065-60, Caribbean Coast." The trolley exterior shall match "Benjamin Moore 2141-50, Horizon Gray, or color for metal wall panels, Section 07410 - Metal Wall Panels.
3. The spreader shall be painted Safety Yellow with black stripes at the lower portion of the structure.
4. The bottom sill beams and truck assemblies shall be painted Black with Safety Yellow stripes applied as shown on the Drawings.
5. Paint markings shown on the Drawings for automatic positioning of containers shall be painted High Gloss Black.
6. All paint striping and markings for safety shall be Safety Yellow and applied as specified herein.
7. Difficult to spray areas such as sharp plate edges shall be power tool broken (chamfer or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
8. The paint system shall not crack or flake off within the guarantee period.

**B. Surface Preparation**

1. Surfaces shall be thoroughly prepared in accordance with SSPC SP-10. Oils and greases shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.
2. Three types of coatings shall be used for coating the crane structures and outfit. The coatings shall consist of a primer coat, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - a. Primer: One coat of Epoxy Zinc rich primer with a dry film thickness of at least 65 microns
  - b. Intermediate: One coat of Epoxy Micaceous iron oxide applied at manufacturer's plant with a dry film thickness of at least 140 microns.
  - c. Finish: Two coats of polyurethane recoatable finish applied at manufacturer's plant with a dry film thickness of at least 40 microns each.

**C. Miscellaneous**

1. Coatings for the interior of machinery house, trolley house and electrical room shall be similar to the external surfaces except that a minimum required total dry film thickness for these parts shall be at least 155 microns.
2. Structures damaged during transportation, storage, erection and testing shall be painted on site in accordance with the requirements.
3. Non-ferrous metals, corrosion resisting steel, machined surfaces and surfaces in sliding or friction contact shall not be painted.
4. Internal accessible box sections shall be prepared as specified herein and coated with primer and intermediate coats as specified.
5. Machinery units, electrical equipment and panels, and other purchased components shall have the manufacturer's standard paint system and shall not be coated except as required to touch up paint damaged in handling or assembly. Exterior components shall be given one finish coat to color coordinate with the final crane color scheme.
6. Surfaces that do not require coating shall be protected during the coating of adjacent work. Machine finished ferrous parts and surfaces, which do not require painting, shall be coated with a suitable rust preventative compound immediately after cleaning.
7. Machined surfaces shall be coated with rust protection lacquer. For standard components, motors, gear boxes etc., the manufacturer's standard coat.

## 2.10 SPARE PARTS AND MAINTENANCE MATERIALS

- A. The crane manufacturer shall provide any special tools required, and manufacturer's recommended spare parts. At a minimum, the following spare parts or their equivalents shall be provided:

Table 6: Spare Parts List

Description of Part		Quantity
<b>Gantry Travel</b>		
Gantry Travel Reducer	PC	1
Gantry Crane Travel Drive Motor With Brake	PC	1
Gear Coupling For Gantry Drive	PC	2
Brake Pads	SET	4
Gantry Drive Wheel	PC	2
Bearings For Gearbox	SET	4
Bearings For Wheels	PC	3
Sealing Snap Rings	SET	8
Slave Wheel	PC	2
<b>Trolley Travel</b>		
Trolley Travel Reducer	PC	1
Trolley Travel Motor	PC	1
Trolley Travel Brake Assembly	PC	1
Brake Pads	SET	2
Gear Coupling For Trolley Drive	PC	1
Spherical Roller Bearing	PC	2
Rotary Shaft Seal	PC	2
Guide Roller	PC	2
Locking Ring	SET	2
Roller Bearing	PC	2
<b>Main Hoist</b>		
Hoist Reducer	PC	1
Hoist Motor	PC	1
Motor Coupling	PC	1
Disc/Drum Shoe Brake Assembly	PC	1
Brake Drum/Disc	PC	1
Brake Shoes/Pads	SET	2
Spherical Roller Bearing	PC	2
Spherical Roller Bearing	PC	2
Rotary Shaft Seal	PC	1
Rotary Shaft Seal	PC	1
Joint Bearing	PC	1
Hoist Gear Type Limit Switch	PC	1
Drive Flange For Limit Switch	PC	1
Load Cell	PC	1

Table 6: Spare Parts List

Description of Part		Quantity
Rope Sheave	PC	2
Wire Rope	LOT	1
Guide Sleeve	PC	4
Joint Bearing	PC	4
<b>Spreader</b>		
Complete Spreader Assembly	SET	1
Twistlocks Pins & Nut	LOT	2
Side Shifter Actuator	PC	2
Electric Motor (Side Shift Actuation)	PC	1
Side Shift Actuation Assembly	PC	1
Indicator light Assembly ( Side Shift Actuation)	SET	1
Limit Switch (Side Shift Actuation)	PC	2
Replacement Bulbs (Side Shift Actuation)	PC	1
Twistlock Assembly	PC	2
Electric Motor (Flipper Actuation)	PC	1
Electric Motor (Twist Lock Actuation)	PC	1
Flipper Actuation Assembly	PC	1
Twistlock Actuation Assembly	PC	1
Indicator Light Assembly (Flipper Actuation)	SET	2
Indicator Light Assembly (Twist Lock Actuation)	SET	2
Limit switch (Flipper Actuation)	PC	2
Limit Switch (Twist Lock Actuation)	PC	2
Replacement bulbs for Flipper Actuation	PC	6
Replacement Bulbs for Twist Lock Actuation	PC	6
<b>Electrical Equipment</b>		
Replacement Bulbs for all lights	SET	4
Replaceable Contactor Contacts and Coil, each type	SET	2
Runway Conductor Rail, longest length	PC	2
Runway Conductor Rail Pickup Shoes	SET	2
Runway Conductor Collector Arm Assembly	PC	2
Toggle and Selector Switches, Each Type	PC	2
Indicator Lamp Holder Assembly, each type	PC	2
Indicator Lamp Lens, each type and color	PC	2
Circuit Breakers, each type and rating	EA	2
Gantry Alarm	PC	2
E-Stop Push Button	SET	2
Push Button, each type, size and color	PC	2
Spreader Cable	LOT	2
Contact Insert	PC	1
Contact Insert Spreader	PC	1
Spreader Plug	PC	1
PLC, each type	PC	2

Table 6: Spare Parts List

Description of Part		Quantity
Load Display	SET	2
Joystick Master Switch, each type	PC	2
Intercom Indoor	PC	1
Intercom Outdoor (if different unit)	PC	1
Limit Switches Each Type Installed Set	SET	1
Fuses For AC Power And Control, each type and rating	SET	6
For each 10 fuses above first 10, each type and rating	SET	2
PLC I/O Module Each Type Installed	SET	1
Contactors, Relays, Timers For Each Type	SET	1
Touch Pad	SET	2
Printer Ribbon, toner and cartridge	SET	2
<b>Miscellaneous</b>		
Load Cell	LOT	1
AC Unit, Operator's Cabin	PC	1
AC Unit, Trolley House	PC	1
Chain	LOT	1

- B. Provide maintenance manuals in accordance with Section 01831 – Operation and Maintenance manuals.

## 2.11 CRANE OPERATIONS SEQUENCE

- A. The marine transfer station has three (3) mooring berths along the pier. Berth one (1) is provided in way of the crane operating area for unloading and loading barges. The remaining two (2) berths are available for temporary tug barge mooring/shifting. The unloading and loading sequence herein has been developed to provide the maximum operating efficiency of the crane while maintaining barge stability.
1. The operating crane sequence has been developed as guidance for the crane operator and the pier supervisor/foreman to track container movement at the station. The sequence describes the facility operations for unloading and loading two (2) container barges and operations during barge shifting. In general the operating sequence developed is diagrammatically presented herein.
    - a. The crane operating sequence for the first barge requires the removal of eight (8) empty containers from the forward most cells on the barge to commence the load-out operation. Three (3) containers will be removed and immediately transferred to waiting shuttle cars to start the operation. The remaining five (5) containers in the FWD cells will be removed and



prestaged in the designated buffer area and handled when required to complete first the barge load-out.

- b. The crane operator starts the barge unloading process by removing the innermost top container (nearest the pier) from the top tier of the first bay on the barge. The unloading sequence continues by removing containers away from the pier (outboard), until row-by-row and transferring them to the three (3) waiting shuttle cars buffer area on the pier. After the four (4) top rows of containers are removed, the crane returns to the inboard cell and starts to remove the lower tier containers. The unloading process continues outboard the lower containers are removed and the entire first bay is empty.
- c. Once the first bay is empty, the loading sequence can start. The first loaded container is placed in the lower inboard cell, after positioning this container in place, the crane proceeds to remove an empty container from the adjacent row.
- d. The sequence continues along the length of the barge until all of the empties are removed and replaced with filled containers. The remaining five (5) empty containers pre-staged earlier on the pier are loaded onto the waiting shuttle cars and are last to be loaded onto the barge when filled.
- e. To maintain barge stability, it should be noted that not more than eight (8) container positions will remain empty on the barge at any time. When eight (8) empty containers have been removed from the barge, the crane will then begin loading waste-filled containers into the empty cells in sequence as described above. Loading will occur in reverse unloading sequence, with only one transverse bay of cells being filled at a given time. Upon completion of the barge load out, the barge will be shifted from the pier. A barge with empty containers will be positioned for continued container handling operations. During barge shifting, the container crane continues to operate by loading empty and full containers from the buffered stowage area to the shuttle cars in preparation for handling containers on the second barge.
- f. The crane manufacturer shall use the following crane operation sequence as by the Diagram of Operating Sequence for Crane 1 as guidance to program/set-up the operator's touch pad screen of the crane automated positioning system.

#### B. Crane Stowage

1. Normal Operating Conditions: Under normal operating conditions or when maintenance is being performed, the parked crane shall be stowed at one end of the pier, away from the operation. The pin locks shall be engaged to secure the crane.

2. Severe Storm Conditions: Under severe storm conditions, the cranes shall be stowed nested bumper-to-bumper to prevent a run-away crane from striking the other crane. This will require that both cranes be secured, tied-down and stowed with the pin-locks engaged.

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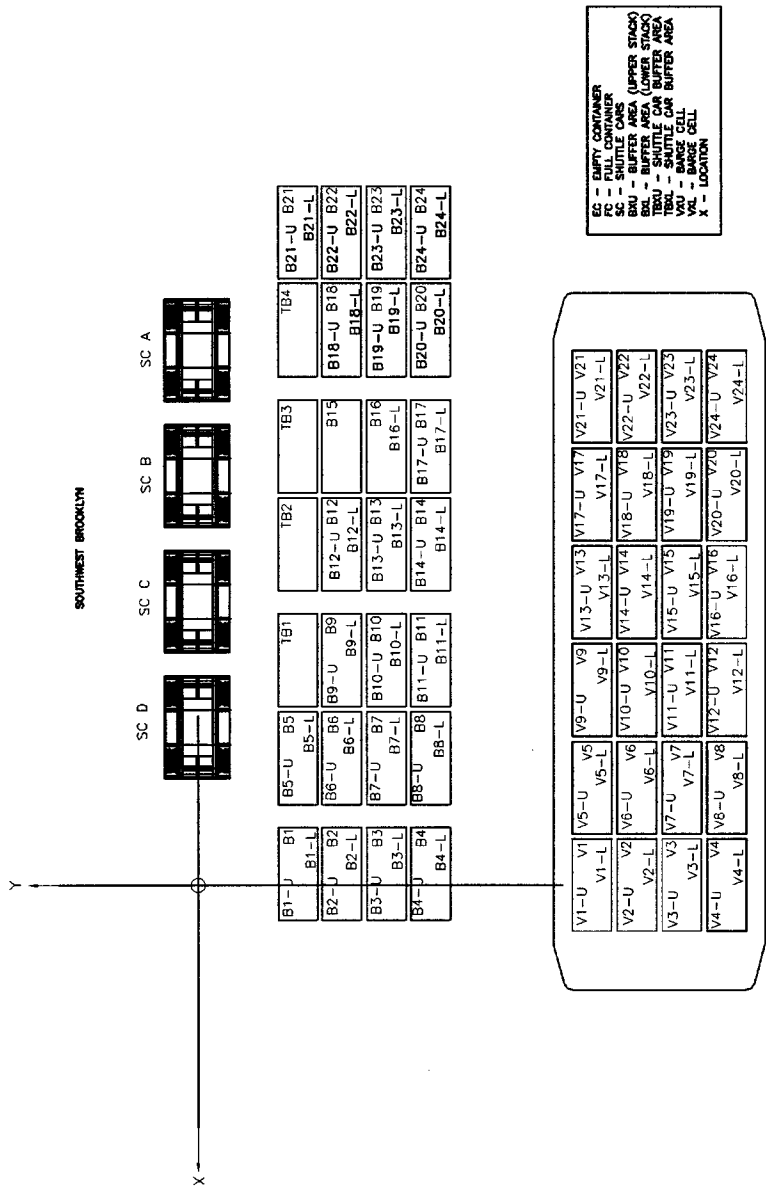


Diagram of Operating Sequence for Crane 1

## Sequence 1 Crane 1 Operation with 1st Barge

STEP	OPERATION		
1	Move (EC) container from barge cell V1U to shuttle car D	V1U	→ D
2	Travel from shuttle car D to barge cell V2U	D	→ V2U
3	Move (EC) container from barge cell V2U to shuttle car C	V2U	→ C
4	Travel from shuttle car C to barge cell V3U	C	→ V3U
5	Move (EC) container from barge cell V3U to shuttle car B	V3U	→ B
6	Travel from shuttle car B to barge cell V4U	B	→ V4U
7	Move (EC) container from barge cell V4U to shuttle car buffer area TB1L	V4U	→ TB1L
8	Travel from shuttle car buffer area TB1L to barge cell V1L	TB1L	→ V1L
9	Move (EC) container from barge cell V1L to shuttle car buffer area TB2L	V1L	→ TB2L
10	Travel from shuttle car buffer area TB2L to barge cell V2L	TB2L	→ V2L
11	Move (EC) container from barge cell V2L to shuttle car buffer area TB3L	V2L	→ TB3L
12	Travel from shuttle car buffer area TB3L to barge cell V3L	TB3L	→ V3L
13	Move (EC) container from barge cell V3L to shuttle car buffer area TB4L	V3L	→ TB4L
14	Travel shuttle car buffer area TB4L to barge cell V4L	TB4L	→ V4L
15	Move (EC) container from barge cell V4L to shuttle car buffer area TB1U	V4L	→ TB1U
16	Travel from shuttle car buffer area TB1U to shuttle car D	TB1U	→ D
17	Move (FC) container from shuttle car D to barge cell V1L	D	→ V1L
18	Travel from barge cell V1L to barge cell V5U	V1L	→ V5U
19	Move (EC) container from barge cell V5U to shuttle car D	V5U	→ D
20	Travel from shuttle car D to barge cell V6U	D	→ V6U
21	Move (EC) container from barge cell V6U to shuttle car buffer area TB2U	V6U	→ TB2U
22	Travel from shuttle car buffer area TB2U to shuttle car C	TB2U	→ C
23	Move (FC) container from shuttle car C to barge cell V2L	C	→ V2L
24	Travel from barge cell V2L to barge cell V7U	V2L	→ V7U
25	Move (EC) container from barge cell V7U to shuttle car C	V7U	→ C
26	Travel from shuttle car C to barge cell V8U	C	→ V8U
27	Move (EC) container from barge cell V8U to shuttle car buffer area TB3U	V8U	→ TB3U

STEP	OPERATION		
28	Travel from shuttle car buffer area TB3U to shuttle car B	TB3U	→ B
29	Move (FC) container from shuttle car B to barge cell V3L	B	→ V3L
30	Travel from barge cell V3L to barge cell V5L	V3L	→ V5L
31	Move (EC) container from barge cell V5L to shuttle car B	V5L	→ B
32	Travel from shuttle car B to barge cell V6L	B	→ V6L
33	Move (EC) container from barge cell V6L to shuttle car buffer area TB4U	V6L	→ TB4U
34	Travel from shuttle car buffer area TB4U to shuttle car D	TB4U	→ D
35	Move (FC) container from shuttle car D to barge cell V4L	D	→ V4L
36	Travel from barge cell V4L to barge cell V7L	V4L	→ V7L
37	Move (EC) container from barge cell V7L to shuttle car D	V7L	→ D
38	Travel from shuttle car D to shuttle car C	D	→ C
39	Move (FC) container from shuttle car C to barge cell V1U	C	→ V1U
40	Travel from barge cell V1U to barge cell V8L	V1U	→ V8L
41	Move (EC) container from barge cell V8L to shuttle car C	V8L	→ C
42	Travel from shuttle car C to shuttle car B	C	→ B
43	Move (FC) container from shuttle car B to barge cell V2U	B	→ V2U
44	Travel from barge cell V2U to barge cell V9U	V2U	→ V9U
45	Move (EC) container from barge cell V9U to shuttle car B	V9U	→ B
46	Travel from shuttle car B to shuttle car D	B	→ D
47	Move (FC) container from shuttle car D to barge cell V3U	D	→ V3U
48	Travel from barge cell V3U to barge cell V10U	V3U	→ V10U
49	Move (EC) container from barge cell V10U to shuttle car D	V10U	→ D
50	Travel from shuttle car D to shuttle car C	D	→ C
51	Move (FC) container from shuttle car C to barge cell V4U	C	→ V4U
52	Travel from barge cell V4U to barge cell V11U	V4U	→ V11U
53	Move (EC) container from barge cell V11U to shuttle car C	V11U	→ C
54	Travel from shuttle car C to shuttle car B	C	→ B
55	Move (FC) container from shuttle car B to barge cell V5L	B	→ V5L

STEP	OPERATION	V5L	→	V12U
56	Travel from barge cell V5L to barge cell V12U	V5L	→	V12U
57	Move (EC) container from barge cell V12U to shuttle car B	V12U	→	B
58	Travel from shuttle car B to shuttle car D	B	→	D
59	Move (FC) container from shuttle car D to barge cell V6L	D	→	V6L
60	Travel from barge cell V6L to barge cell V9L	V6L	→	V9L
61	Move (EC) container from barge cell V9L to shuttle car D	V9L	→	D
62	Travel from shuttle car D to shuttle car C	D	→	C
63	Move (FC) container from shuttle car C to barge cell V7L	C	→	V7L
64	Travel from barge cell V7L to barge cell V10L	V7L	→	V10L
65	Move (EC) container from barge cell V10L to shuttle car C	V10L	→	C
66	Travel from shuttle car C to shuttle car B	C	→	B
67	Move (FC) container from shuttle car B to barge cell V8L	B	→	V8L
68	Travel from barge cell V8L to barge cell V11L	V8L	→	V11L
69	Move (EC) container from barge cell V11L to shuttle car B	V11L	→	B
70	Travel from shuttle car B to shuttle car D	B	→	D
71	Move full container (FC) from shuttle car D to barge cell V5U	D	→	V5U
72	Travel from barge cell V5U to barge cell V12L	V5U	→	V12L
73	Move (EC) container from barge cell V12L to shuttle car D	V12L	→	D
74	Travel from shuttle car D to shuttle car C	D	→	C
75	Move (FC) container from shuttle car C to barge cell V6U	C	→	V6U
76	Travel from barge cell V6U to barge cell V13U	V6U	→	V13U
77	Move (EC) container from barge cell V13U to shuttle car C	V13U	→	C
78	Travel from shuttle car C to shuttle car B	C	→	B
79	Move (FC) container from shuttle car B to barge cell V7U	B	→	V7U
80	Travel from barge cell V7U to barge cell V14U	V7U	→	V14U
81	Move (EC) container from barge cell V14U to shuttle car B	V14U	→	B
82	Travel from shuttle car B to shuttle car D	B	→	D
83	Move (FC) container from shuttle car D to barge cell V8U	D	→	V8U

STEP	OPERATION		
84	Travel from barge cell V8U to barge cell V15U	V8U	→ V15U
85	Move (EC) container from barge cell V15U to shuttle car D	V15U	→ D
86	Travel from shuttle car D to shuttle car C	D	→ C
87	Move (FC) container from shuttle car C to barge cell V9L	C	→ V9L
88	Travel from barge cell V9L to barge cell V16U	V9L	→ V16U
89	Move (EC) container from barge cell V16U to shuttle car C	V16U	→ C
90	Travel from shuttle car C to shuttle car B	C	→ B
91	Move (FC) container from shuttle car B to barge cell V10L	B	→ V10L
92	Travel from barge cell V10L to barge cell V13L	V10L	→ V13L
93	Move (EC) container from barge cell V13L to shuttle car B	V13L	→ B
94	Travel from shuttle car B to shuttle car D	B	→ D
95	Move (FC) container from shuttle car D to barge cell V11L	D	→ V11L
96	Travel from barge cell V11L to barge cell V14L	V11L	→ V14L
97	Move (EC) container from barge cell V14L to shuttle car D	V14L	→ D
98	Travel from shuttle car D to shuttle car C	D	→ C
99	Move (FC) container from shuttle car C to barge cell V12L	C	→ V12L
100	Travel from barge cell V12L to barge cell V15L	V12L	→ V15L
101	Move (EC) container from barge cell V15L to shuttle car C	V15L	→ C
102	Travel from shuttle car C to shuttle car B	C	→ B
103	Move (FC) container from shuttle car B to barge cell V9U	B	→ V9U
104	Travel from barge cell V9U to barge cell V16L	V9U	→ V16L
105	Move (EC) container from barge cell V16L to shuttle car B	V16L	→ B
106	Travel from shuttle car B to shuttle car D	B	→ D
107	Move (FC) container from shuttle car D to barge cell V10U	D	→ V10U
108	Travel from barge cell V10U to barge cell V17U	V10U	→ V17U
109	Move (EC) container from barge cell V17U to shuttle car D	V17U	→ D
110	Travel from shuttle car D to shuttle car C	D	→ C
111	Move (FC) container from shuttle car C to barge cell V11U	C	→ V11U

STEP	OPERATION		
112	Travel from barge cell V11U to barge cell V18U	V11U	→ V18U
113	Move (EC) container from barge cell V18U to shuttle car C	V18U	→ C
114	Travel from shuttle car C to shuttle car B	C	→ B
115	Move (FC) container from shuttle car B to barge cell V12U	B	→ V12U
116	Travel from barge cell V12U to barge cell V19U	V12U	→ V19U
117	Move (EC) container from barge cell V19U to shuttle car B	V19U	→ B
118	Travel from shuttle car B to shuttle car D	B	→ D
119	Move (FC) container from shuttle car D to barge cell V13L	D	→ V13L
120	Travel from barge cell V13L to barge cell V20U	V13L	→ V20U
121	Move (EC) container from barge cell V20U to shuttle car D	V20U	→ D
122	Travel from shuttle car D to shuttle car C	D	→ C
123	Move (FC) container from shuttle car C to barge cell V14L	C	→ V14L
124	Travel from barge cell V14L to barge cell V17L	V14L	→ V17L
125	Move (EC) container from barge cell V17L to shuttle car C	V17L	→ C
126	Travel from shuttle car C to shuttle car B	C	→ B
127	Move (FC) container from shuttle car B to barge cell V15L	B	→ V15L
128	Travel from barge cell V15L to barge cell V18L	V15L	→ V18L
129	Move (EC) container from barge cell V18L to shuttle car B	V18L	→ B
130	Travel from shuttle car B to shuttle car D	B	→ D
131	Move (FC) container from shuttle car D to barge cell V16L	D	→ V16L
132	Travel from barge cell V16L to barge cell V19L	V16L	→ V19L
133	Move (EC) container from barge cell V19L to shuttle car D	V19L	→ D
134	Travel from shuttle car D to shuttle car C	D	→ C
135	Move (FC) container from shuttle car C to barge cell V13U	C	→ V13U
136	Travel from barge cell V13U to barge cell V20L	V13U	→ V20L
137	Move (EC) container from barge cell V20L to shuttle car C	V20L	→ C
138	Travel from shuttle car C to shuttle car B	C	→ B
139	Move (FC) container from shuttle car B to barge cell V14U	B	→ V14U



STEP	OPERATION		
140	Travel from barge cell V14U to barge cell V21U	V14U	→ V21U
141	Move (EC) container from barge cell V21U to shuttle car B	V21U	→ B
142	Travel from shuttle car B to shuttle car D	B	→ D
143	Move (FC) container from shuttle car D to barge cell V15U	D	→ V15U
144	Travel from barge cell V15U to barge cell V22U	V15U	→ V22U
145	Move (EC) container from barge cell V22U to shuttle car D	V22U	→ D
146	Travel from shuttle car D to shuttle car C	D	→ C
147	Move (FC) container from shuttle car C to barge cell V16U	C	→ V16U
148	Travel from barge cell V16U to barge cell V23U	V16U	→ V23U
149	Move (EC) container from barge cell V23U to shuttle car C	V23U	→ C
150	Travel from shuttle car C to shuttle car B	C	→ B
151	Move (FC) container from shuttle car B to barge cell V17L	B	→ V17L
152	Travel from barge cell V17L to barge cell V24U	V17L	→ V24U
153	Move (EC) container from barge cell V24U to shuttle car B	V24U	→ B
154	Travel from shuttle car B to shuttle car D	B	→ D
155	Move (FC) container from shuttle car D to barge cell V18L	D	→ V18L
156	Travel from barge cell V18L to barge cell V21L	V18L	→ V21L
157	Move (EC) container from barge cell V21L to shuttle car D	V21L	→ D
158	Travel from shuttle car D to shuttle car C	D	→ C
159	Move (FC) container from shuttle car C to barge cell V19L	C	→ V19L
160	Travel from barge cell V19L to barge cell V22L	V19L	→ V22L
161	Move (EC) container from V22L to shuttle car C	V22L	→ C
162	Travel from shuttle car C to shuttle car B	C	→ B
163	Move (FC) container from shuttle car B to barge cell V20L	B	→ V20L
164	Travel from barge cell V20L to barge cell V23L	V20L	→ V23L
165	Move (EC) container from barge cell V23L to shuttle car B	V23L	→ B
166	Travel from shuttle car B to shuttle car D	B	→ D
167	Move (FC) container from shuttle car D to barge cell V17U	D	→ V17U

STEP	OPERATION		
168	Travel from barge cell V17U to barge cell V24L	V17U	→ V24L
169	Move (EC) container from barge cell V24L to shuttle car D	V24L	→ D
170	Travel from shuttle car D to shuttle car C	D	→ C
171	Move (FC) container from shuttle car C to barge cell V18U	C	→ V18U
172	Travel from barge cell V18U to shuttle car buffer area TB1U	V18U	→ TB1U
173	Move (EC) container from shuttle car buffer area TB1U to shuttle car C	TB1U	→ C
174	Travel from shuttle car C to shuttle car B	C	→ B
175	Move (FC) container from shuttle car B to barge cell V19U	B	→ V19U
176	Travel from barge cell V19U to shuttle car buffer area TB4U	V19U	→ TB4U
177	Move (EC) container from shuttle car buffer area TB4U to shuttle car B	TB4U	→ B
178	Travel from shuttle car B to shuttle car D	B	→ D
179	Move (FC) container from shuttle car D to barge cell V20U	D	→ V20U
180	Travel from barge cell V20U to shuttle car buffer area TB1L	V20U	→ TB1L
181	Move (EC) container from shuttle car buffer area TB1L to shuttle car D	TB1L	→ D
182	Travel from shuttle car D to shuttle car C	D	→ C
183	Move (FC) container from shuttle car C to barge cell V21L	C	→ V21L
184	Travel from barge cell V21L to shuttle car buffer area TB2U	V21L	→ TB2U
185	Move (EC) container from shuttle car buffer area TB2U to shuttle car C	TB2U	→ C
186	Travel from shuttle car C to shuttle car B	C	→ B
187	Move (FC) container from shuttle car B to barge cell V22L	B	→ V22L
188	Travel from barge cell V22L to shuttle car buffer area TB4L	V22L	→ TB4L
189	Move (EC) container from shuttle car buffer area TB4L to shuttle car B	TB4L	→ B
190	Travel from shuttle car B to shuttle car D	B	→ D
191	Move (FC) container from shuttle car D to barge cell V23L	D	→ V23L
192	Travel from barge cell V23L to shuttle car buffer area TB2L	V23L	→ TB2L
193	Move (EC) container from shuttle car buffer area TB2L to shuttle car D	TB2L	→ D
194	Travel from shuttle car D to shuttle car C	D	→ C
195	Move (FC) container from shuttle car C to barge cell V24L	C	→ V24L

STEP	OPERATION		
196	Travel from barge cell V24L to shuttle car buffer area TB3U	V24L	→ TB3U
197	Move (EC) container from shuttle car buffer area TB3U to shuttle car C	TB3U	→ C
198	Travel from shuttle car C to shuttle car B	C	→ B
199	Move (FC) container from shuttle car B to barge cell V21U	B	→ V21U
200	Travel from barge cell V21U to shuttle car buffer area TB3L	V21U	→ TB3L
201	Move (EC) container from shuttle car buffer area TB3L to shuttle car B	TB3L	→ B
202	Travel from shuttle car B to shuttle car D	B	→ D
203	Move (FC) container from shuttle car D to barge cell V22U	D	→ V22U
204	Travel from barge cell V22U to buffer area B1U	V22U	→ B1U
205	Move (EC) container from buffer area B1U to shuttle car D	B1U	→ D
206	Travel from shuttle car D to shuttle car C	D	→ C
207	Move (FC) container from shuttle car C to barge cell V23U	C	→ V23U
208	Travel from barge cell V23U to buffer area B1L	V23U	→ B1L
209	Move (EC) container from buffer area B1L to shuttle car C	B1L	→ C
210	Travel from shuttle car C to shuttle car B	C	→ B
211	Move (FC) container from shuttle car B to barge cell V24U	B	→ V24U

## Sequence 2 Crane 1 Operations during Shifting Of 1st Barge

STEP	OPERATION	V24U	→	B2U
1	Travel from barge cell V24U to buffer area B2U	V24U	→	B2U
2	Move (EC) container from buffer area B2U to shuttle car B	B2U	→	B
3	Travel from shuttle car B to shuttle car D	B	→	D
4	Move (FC) container from shuttle car D to shuttle car buffer area TB1L	D	→	TB1L
5	Travel from shuttle car buffer area TB1L to buffer area B2L	TB1L	→	B2L
6	Move (EC) container from buffer area B2L to shuttle car D	B2L	→	D
7	Travel from shuttle car D to shuttle car C	D	→	C
8	Move (FC) container from shuttle car C to shuttle car buffer area TB1U	C	→	TB1U
9	Travel from shuttle car buffer area TB1U to buffer area B3U	TB1U	→	B3U
10	Move (EC) container from buffer area B3U to shuttle car C	B3U	→	C
11	Travel from shuttle car C to shuttle car B	C	→	B
12	Move (FC) container from shuttle car B to shuttle car buffer area TB2L	B	→	TB2L
13	Travel from shuttle car buffer area TB2L to buffer area B3L	TB2L	→	B3L
14	Move (EC) container from buffer area B3L to shuttle car B	B3L	→	B
15	Travel from shuttle car B to shuttle car D	B	→	D
16	Move (FC) container from shuttle car D to shuttle car buffer area TB2U	D	→	TB2U
17	Travel from shuttle car buffer area TB2U to buffer area B4U	TB2U	→	B4U
18	Move (EC) container from buffer area B4U to shuttle car D	B4U	→	D
19	Travel from shuttle car D to shuttle car C	D	→	C
20	Move (FC) container from shuttle car C to shuttle car buffer area TB3L	C	→	TB3L
21	Travel from shuttle car buffer area TB3L to buffer area B4L	TB3L	→	B4L
22	Move (EC) container from buffer area B4L to shuttle car C	B4L	→	C
23	Travel from shuttle car C to shuttle car B	C	→	B
24	Move (FC) container from shuttle car B to shuttle car buffer area TB3U	B	→	TB3U
25	Travel from shuttle car buffer area TB3U to buffer area B5U	TB3U	→	B5U
26	Move (EC) container from buffer area B5U to shuttle car B	B5U	→	B

STEP	OPERATION		
27	Travel from shuttle car B to shuttle car D	B	→
28	Move (FC) container from shuttle car D to shuttle car buffer area TB4L	D	→
29	Travel from shuttle car buffer area TB4L to buffer area B5L	TB4L	→
30	Move (EC) container from buffer area B5L to shuttle car D	B5L	→
31	Travel from shuttle car D to shuttle car C	D	→
32	Move (FC) container from shuttle car C to shuttle car buffer area TB4U	C	→
33	Travel from shuttle car buffer area TB4U to buffer area B6U	TB4U	→
34	Move (EC) container from buffer area B6U to shuttle car C	B6U	→
35	Travel from shuttle car C to shuttle car B	C	→
36	Move (FC) container from shuttle car B to buffer area B4L	B	→
37	Travel from buffer area B4L to buffer area B6L	B4L	→
38	Move (EC) container from buffer area B6L to shuttle car B	B6L	→
39	Travel from shuttle car B to shuttle car D	B	→
40	Move (FC) container from shuttle car D to buffer area B4U	D	→
41	Travel from buffer area B4U to buffer area B7U	B4U	→
42	Move (EC) container from buffer area B7U to shuttle car D	B7U	→
43	Travel from shuttle car D to shuttle car C	D	→
44	Move (FC) container from shuttle car C to buffer area B3L	C	→
45	Travel from buffer area B3L to buffer area B7L	B3L	→
46	Move (EC) container from buffer area B7L to shuttle car C	B7L	→
47	Travel from shuttle car C to shuttle car B	C	→
48	Move (FC) container from shuttle car B to buffer area B3U	B	→
49	Travel from buffer area B3U to buffer area B8U	B3U	→
50	Move (EC) container from buffer area B8U to shuttle car B	B8U	→
51	Travel from shuttle car B to shuttle car D	B	→
52	Move (FC) container from shuttle car D to buffer area B7L	D	→
53	Travel from buffer area B7L to buffer area B8L	B7L	→
54	Move (EC) container from buffer area B8L to shuttle car D	B8L	→

STEP	OPERATION		
55	Travel from shuttle car D to shuttle car C	D	➡
56	Move (FC) container from shuttle car C to buffer area B7U	C	➡
57	Travel from buffer area B7U to buffer area B9U	B7U	➡
58	Move (EC) container from buffer area B9U to shuttle car C	B9U	➡
59	Travel from shuttle car C to shuttle car B	C	➡
			B

Sequence 3 Crane 1 Operation 2<sup>nd</sup> Barge Moored At Position 1

STEP	OPERATION		
1	Move (FC) container from shuttle car B to buffer area B6L	B	→ B6L
2	Travel from buffer area B6L to barge cell V1U	B6L	→ V1U
3	Move (EC) container from barge cell V1U to shuttle car B	V1U	→ B
4	Travel from shuttle car B to barge cell V2U	B	→ V2U
5	Move (EC) container from barge cell V2U to buffer area B9U	V2U	→ B9U
6	Travel from buffer area B9U to shuttle car D	B9U	→ D
7	Move (FC) container from shuttle car D buffer area B6U	D	→ B6U
8	Travel from buffer area B6U to barge cell V3U	B6U	→ V3U
9	Move (EC) container from barge cell V3U to shuttle car D	V3U	→ D
10	Travel from shuttle car D to barge cell V4U	D	→ V4U
11	Move (EC) container from barge cell V4U to buffer area B1L	V4U	→ B1L
12	Travel from buffer area B1L to shuttle car C	B1L	→ C
13	Move (FC) container from shuttle car C to buffer area B8L	C	→ B8L
14	Travel from buffer area B8L to barge cell V1L	B8L	→ V1L
15	Move (EC) container from barge cell V1L to shuttle car C	V1L	→ C
16	Travel from shuttle car C to barge cell V2L	C	→ V2L
17	Move (EC) container from barge cell V2L to buffer area B1U	V2L	→ B1U
18	Travel from buffer area B1U to shuttle car B	B1U	→ B
19	Move (FC) container from shuttle car B to barge cell V1L	B	→ V1L
20	Travel from barge cell V1L to barge cell V3L	V1L	→ V3L
21	Move (EC) container from barge cell V3L to shuttle car B	V3L	→ B
22	Travel from shuttle car B to barge cell V4L	B	→ V4L
23	Move (EC) container from barge cell V4L to buffer area B2L	V4L	→ B2L
24	Travel from buffer area B2L to shuttle car D	B2L	→ D
25	Move (FC) container from shuttle car D to barge cell V2L	D	→ V2L
26	Travel from barge cell V2L to barge cell V5U	V2L	→ V5U

STEP	OPERATION		
27	Move (EC) container from barge cell V5U to shuttle car D	V5U	→ D
28	Travel from shuttle car D to buffer area B8L	D	→ B8L
29	Move (FC) container from buffer area B8L to barge cell V3L	B8L	→ V3L
30	Travel from barge cell V3L to barge cell V6U	V3L	→ V6U
31	Move (EC) container from barge cell V6U to buffer area B2U	V6U	→ B2U
32	Travel from buffer area B2U to shuttle car C	B2U	→ C
33	Move (FC) container from shuttle car C to barge cell V4L	C	→ V4L
34	Travel from barge cell V4L to barge cell V7U	V4L	→ V7U
35	Move (EC) container from barge cell V7U to shuttle car C	V7U	→ C
36	Travel from shuttle car C to buffer area B3U	C	→ B3U
37	Move (FC) container from buffer area B3U to barge cell V1U	B3U	→ V1U
38	Travel from barge cell V1U to shuttle car B	V1U	→ B
39	Move (FC) container from shuttle car B to barge cell barge cell V2U	B	→ V2U
40	Travel from barge cell V2U to barge cell V8U	V2U	→ V8U
41	Move (EC) container from barge cell V8U to shuttle car B	V8U	→ B
42	Travel from shuttle car B to buffer area B3L	B	→ B3L
43	Move (FC) container from buffer area B3L to barge cell V3U	B3L	→ V3U
44	Travel from barge cell V3U to shuttle car D	V3U	→ D
45	Move (FC) container from shuttle car D to barge cell V4U	D	→ V4U
46	Travel from barge cell V4U to barge cell V5L	V4U	→ V5L
47	Move (EC) container from barge cell V5L to shuttle car D	V5L	→ D
48	Travel from shuttle car D to buffer area B6U	D	→ B6U
49	Move (FC) container from buffer area B6U to barge cell V5L	B6U	→ V5L
50	Travel from barge cell V5L to barge cell V6L	V5L	→ V6L
51	Move (EC) container from barge cell V6L to buffer area B3L	V6L	→ B3L
52	Travel from buffer area B3L to shuttle car C	B3L	→ C
53	Move (FC) container from shuttle car C to barge cell V6L	C	→ V6L
54	Travel from barge cell V6L to barge cell V7L	V6L	→ V7L



STEP	OPERATION	V7L	→	C
55	Move (EC) container from barge cell V7L to shuttle car C	V7L	→	C
56	Travel from shuttle car C to barge cell V8L	C	→	V8L
57	Move (EC) container from barge cell V8L to buffer area B3U	V8L	→	B3U
58	Travel from buffer area B3U to shuttle car B	B3U	→	B
59	Move (FC) container from shuttle car B to barge cell V7L	B	→	V7L
60	Travel from barge cell V7L to barge cell V9U	V7L	→	V9U
61	Move (EC) container from barge cell V9U to shuttle car B	V9U	→	B
62	Travel from shuttle car B to buffer area B6L	B	→	B6L
63	Move (FC) container from buffer area B6L to barge cell V8L	B6L	→	V8L
64	Travel from barge cell V8L to buffer area B4U	V8L	→	B4U
65	Move (FC) container from buffer area B4U to barge cell V5U	B4U	→	V5U
66	Travel from barge cell V5U to shuttle car D	V5U	→	D
67	Move (FC) container from shuttle car D to barge cell V6U	D	→	V6U
68	Travel from barge cell V6U to barge cell V10U	V6U	→	V10U
69	Move (EC) container from V10U to shuttle car D	V10U	→	D
70	Travel from shuttle car D to barge cell V11U	D	→	V11U
71	Move (EC) container from barge cell V11U to buffer area B5L	V11U	→	B5L
72	Travel from buffer area B5L to buffer area B4L	B5L	→	B4L
73	Move (FC) container from buffer area B4L to barge cell V7U	B4L	→	V7U
74	Travel from barge cell V7U to shuttle car C	V7U	→	C
75	Move (FC) container from shuttle car C to barge cell V8U	C	→	V8U
76	Travel from barge cell V8U to barge cell V12U	V8U	→	V12U
77	Move (EC) container from barge cell V12U to shuttle car C	V12U	→	C
78	Travel from shuttle car C to barge cell V9L	C	→	V9L
79	Move (EC) container from barge cell V9L to buffer area B4L	V9L	→	B4L
80	Travel from buffer area B4L to shuttle car B	B4L	→	B
81	Move (FC) container from shuttle car B to barge cell V9L	B	→	V9L
82	Travel from barge cell V9L to barge cell V10L	V9L	→	V10L

STEP	OPERATION		
83	Move (EC) container from barge cell V10L to shuttle car B	V10L	→ B
84	Travel from shuttle car B to barge cell V11L	B	→ V11L
85	Move (EC) container from barge cell V11L to buffer area B5U	V11L	→ B5U
86	Travel from buffer area B5U to shuttle car D	B5U	→ D
87	Move (FC) container from shuttle car D to barge cell V10L	D	→ V10L
88	Travel from V10L to barge cell V12L	V10L	→ V12L
89	Move (EC) container from barge cell V12L to shuttle car D	V12L	→ D
90	Travel from shuttle car D to buffer area B7U	D	→ B7U
91	Move (FC) container from buffer area B7U to barge cell V11L	B7U	→ V11L
92	Travel from barge cell V11L to barge cell V13U	V11L	→ V13U
93	Move (EC) container from barge cell V13U to buffer area B4U	V13U	→ B4U
94	Travel from buffer area B4U to shuttle car C	B4U	→ C
95	Move (FC) container from shuttle car C to barge cell V12L	C	→ V12L
96	Travel from barge cell V12L to barge cell V14U	V12L	→ V14U
97	Move (EC) container from barge cell V14U to shuttle car C	V14U	→ C
98	Travel from shuttle car C to barge cell V15U	C	→ V15U
99	Move (EC) container from barge cell V15U to buffer area B6L	V15U	→ B6L
100	Travel from buffer area B6L to shuttle car B	B6L	→ B
101	Move (FC) container from shuttle car B to barge cell V9U	B	→ V9U
102	Travel from barge cell V9U to barge cell V16U	V9U	→ V16U
103	Move (EC) container from barge cell V16U to shuttle car B	V16U	→ B
104	Travel from shuttle car B to barge cell V13L	B	→ V13L
105	Move (EC) container from barge cell V13L to buffer area B6U	V13L	→ B6U
106	Travel from buffer area B6U to buffer area B7L	B6U	→ B7L
107	Move (FC) container from buffer area B7L to barge cell V10U	B7L	→ V10U
108	Travel from barge cell V10U to shuttle car D	V10U	→ D
109	Move (FC) container from shuttle car D to barge cell V11U	D	→ V11U
110	Travel from barge cell V11U to barge cell V14L	V11U	→ V14L

STEP	OPERATION	V14L	→	D
111	Move (EC) container from barge cell V14L to shuttle car D	V14L	→	D
112	Travel from shuttle car D to barge cell V15L	D	→	V15L
113	Move (EC) container from barge cell V15L to buffer area B7L	V15L	→	B7L
114	Travel from buffer area B7L to barge cell V16L	B7L	→	V16L
115	Move (EC) container from barge cell V16L to buffer area B7U	V16L	→	B7U
116	Travel from buffer area B7U to shuttle car C	B7U	→	C
117	Move (FC) container from shuttle car C to barge cell V12U	C	→	V12U
118	Travel from barge cell V12U to barge cell V17U	V12U	→	V17U
119	Move (EC) container from barge cell V17U to shuttle car C	V17U	→	C
120	Travel from shuttle car C to shuttle car buffer area TB4U	C	→	TB4U
121	Move (FC) container from shuttle car buffer area TB4U to barge cell V13L	TB4U	→	V13L
122	Travel from barge cell V13L to shuttle car B	V13L	→	B
123	Move (FC) container from shuttle car B to barge cell V14L	B	→	V14L
124	Travel from barge cell V14L to barge cell V18U	V14L	→	V18U
125	Move (EC) container from barge cell V18U to shuttle car B	V18U	→	B
126	Travel from shuttle area B to shuttle car buffer area TB4L	B	→	TB4L
127	Move (FC) container from shuttle car buffer area TB4L to barge cell V15L	TB4L	→	V15L
128	Move (EC) container from barge cell V15L to shuttle car D	V15L	→	D
129	Move (FC) container from shuttle car D to barge cell V16L	D	→	V16L
130	Travel from barge cell V16L to barge cell V19U	V16L	→	V19U
131	Move (EC) container from barge cell V19U to shuttle car D	V19U	→	D
132	Travel from shuttle car D to barge cell V20U	D	→	V20U
133	Move (EC) container from barge cell V20U to buffer area B8L	V20U	→	B8L
134	Travel from buffer area B8L to shuttle car C	B8L	→	C
135	Move (FC) container from shuttle car C to barge cell V13U	C	→	V13U
136	Travel from barge cell V13U to barge cell V17L	V13U	→	V17L
137	Move (EC) container from barge cell V17L to shuttle car C	V17L	→	C
138	Travel from shuttle car C to barge cell V18L	C	→	V18L

STEP	OPERATION		
139	Move (EC) container from barge cell V18L to buffer area B8U	V18L	→ B8U
140	Travel from buffer area B8U to shuttle car B	B8U	→ B
141	Move (FC) container from shuttle car B to barge cell V14U	B	→ V14U
142	Travel from barge cell V14U to barge cell V19L	V14U	→ V19L
143	Move (EC) container from barge cell V19L to shuttle car B	V19L	→ B
144	Travel from shuttle car B to shuttle car buffer area TB3U	B	→ TB3U
145	Move (FC) container from shuttle car buffer area TB3U to barge cell V15U	TB3U	→ V15U
146	Travel from barge cell V15U to barge cell V20L	V15U	→ V20L
147	Move (EC) container from barge cell V20L to shuttle car buffer area TB4L	V20L	→ TB4L
148	Travel from shuttle car buffer area TB4L to shuttle car D	TB4L	→ D
149	Move (FC) container from shuttle car D to barge cell V16U	D	→ V16U
150	Travel from barge cell V16U to barge cell V21U	V16U	→ V21U
151	Move (EC) container from barge cell V21U to shuttle car D	V21U	→ D
152	Travel from shuttle car D to shuttle car buffer area TB3L	D	→ TB3L
153	Move (FC) container from shuttle car buffer area TB3L to barge cell V17L	TB3L	→ V17L
154	Travel from barge cell V17L to shuttle car C	V17L	→ C
155	Move (FC) container from shuttle car C to barge cell V18L	C	→ V18L
156	Travel from barge cell V18L to barge cell V22U	V18L	→ V22U
157	Move (EC) container from barge cell V22U to shuttle car C	V22U	→ C
158	Travel from shuttle car C to shuttle car buffer area TB2U	C	→ TB2U
159	Travel from shuttle car buffer area TB2U to barge cell V19L	TB2U	→ V19L
160	Travel from barge cell V19L to barge cell V23U	V19L	→ V23U
161	Move (EC) container from barge cell V23U to shuttle car buffer area TB4U	V23U	→ TB4U
162	Travel from shuttle car buffer area TB4U to shuttle car B	TB4U	→ B
163	Move (FC) container from shuttle car B to barge cell V20L	B	→ V20L
164	Travel from barge cell V20L to barge cell V24U	V20L	→ V24U
165	Move (EC) container from barge cell V24U to shuttle car B	V24U	→ B
166	Travel from shuttle car B to shuttle car buffer area TB2L	B	→ TB2L

STEP	OPERATION		
167	Move (FC) container from shuttle car buffer area TB2L to barge cell V17U	TB2L	↑ V17U
168	Travel from barge cell V17U to barge cell V21L	V17U	↑ V21L
169	Move (EC) container from barge cell V21L to shuttle car buffer area TB2L	V21L	↑ TB2L
170	Travel from shuttle car buffer area TB2L to shuttle car D	TB2L	↑ D
171	Move (FC) container from shuttle car D to barge cell V18U	D	↑ V18U
172	Travel from barge cell V18U to barge cell V22L	V18U	↑ V22L
173	Move (EC) container from barge cell V22L to shuttle car D	V22L	↑ D
174	Travel from shuttle car D to shuttle car buffer area TB1U	D	↑ TB1U
175	Move (FC) container from shuttle car buffer area TB1U to barge cell V19U	TB1U	↑ V19U
176	Travel from barge cell V19U to barge cell V23L	V19U	↑ V23L
177	Move (EC) container from barge cell V23L to shuttle car buffer area TB2U	V23L	↑ TB2U
178	Travel from shuttle car buffer area TB2U to shuttle car C	TB2U	↑ C
179	Move (FC) container from shuttle car C to barge cell V20U	C	↑ V20U
180	Travel from barge cell V20U to barge cell V24L	V20U	↑ V24L
181	Move (EC) container from barge cell V24L to shuttle car C	V24L	↑ C
182	Travel from shuttle car C to shuttle car buffer area TB1L	C	↑ TB1L
183	Move (FC) container from shuttle car buffer area TB1L to barge cell V21L	TB1L	↑ V21L
184	Travel from barge cell V21L to shuttle car B	V21L	↑ B
185	Move (FC) container from shuttle car B to barge cell V22L	B	↑ V22L
186	Travel from barge cell V22L to shuttle car buffer area TB2U	V22L	↑ TB2U
187	Move (EC) container from shuttle car buffer area TB2U to shuttle car B	TB2U	↑ B
188	Travel from shuttle car B to shuttle car D	B	↑ D
189	Move (FC) container from shuttle car D to barge cell V23L	D	↑ V23L
190	Travel from V23L to shuttle car buffer area TB2L	V23L	↑ TB2L
191	Move (EC) container from shuttle car buffer area TB2L to shuttle car D	TB2L	↑ D
192	Travel from shuttle car D to shuttle car C	D	↑ C
193	Move (FC) container from shuttle car C to barge cell V24L	C	↑ V24L
194	Travel from barge cell V24L to shuttle car buffer area TB4U	V24L	↑ TB4U

STEP	OPERATION			
195	Move (EC) container from shuttle car buffer area TB4U to shuttle car C	TB4U	→	C
196	Travel from shuttle car C to shuttle car B	C	→	B
197	Move (FC) container from shuttle car B to barge cell V21U	B	→	V21U
198	Travel from barge cell V21U to shuttle car buffer area TB4L	V21U	→	TB4L
199	Move (EC) container from shuttle car buffer area TB4L to shuttle car B	TB4L	→	B
200	Travel from shuttle car B to shuttle car D	B	→	D
201	Move (FC) container from shuttle car D to barge cell V22U	D	→	V22U
202	Travel from barge cell V22U to shuttle car C	V22U	→	C
203	Move (FC) container from shuttle car C to barge cell V23U	C	→	V23U
204	Travel from barge cell V23U to shuttle car B	V23U	→	B
205	Move (FC) container from shuttle car B to barge cell V24U	B	→	V24U

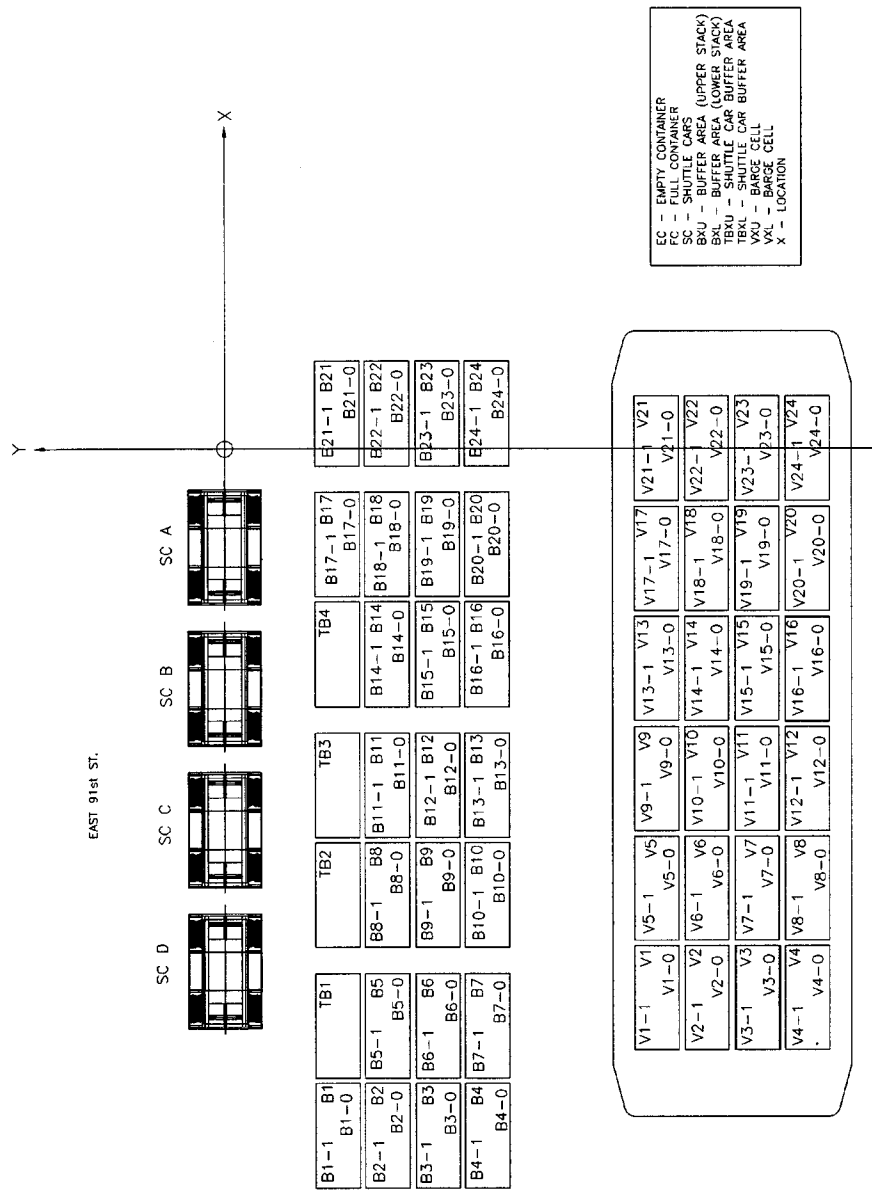


Diagram of Operating Sequence for Crane 2

## Sequence 1 Crane 2 Operation with 1st Barge

STEP	OPERATION		
1	Move (EC) container from barge cell V21U to shuttle car A	V21U	➡ A
2	Travel from shuttle car A to barge cell V22U	A	➡ V22U
3	Move (EC) container from barge cell V22U to shuttle car B	V22U	➡ B
4	Travel from shuttle car B to barge cell V23U	B	➡ V23U
5	Move (EC) container from barge cell V23U and travel to shuttle car C	V23U	➡ C
6	Travel from shuttle car C to barge cell V24U	C	➡ V24U
7	Move (EC) container from barge cell V24U to shuttle car buffer area TB1L	V24U	➡ TB1L
8	Travel from shuttle car buffer area TB1L to barge cell V21L	TB1L	➡ V21L
9	Move (EC) container from barge cell V21L to shuttle car buffer area TB2L	V21L	➡ TB2L
10	Travel from shuttle car buffer area TB2L to barge cell V22L	TB2L	➡ V22L
11	Move (EC) container from barge cell V22L to shuttle car buffer area TB3L	V22L	➡ TB3L
12	Travel from shuttle car buffer area TB3L to barge cell V23L	TB3L	➡ V23L
13	Move (EC) container from barge cell V23L to shuttle car buffer area TB4L	V23L	➡ TB4L
14	Travel from shuttle car buffer area TB4L to barge cell V24L	TB4L	➡ V24L
15	Move (EC) container from barge cell V24L to shuttle car buffer area TB4U	V24L	➡ TB4U
16	Travel from shuttle car buffer area TB4U to shuttle car A	TB4U	➡ A
17	Move (FC) container from shuttle car A to barge cell V21L	A	➡ V21L
18	Travel from barge cell V21L to barge cell V17U	V21L	➡ V17U
19	Move (EC) container from barge cell V17U to shuttle car A	V17U	➡ A
20	Travel from shuttle car A to barge cell V18U	A	➡ V18U
21	Move (EC) container from barge cell V18U to shuttle car buffer area TB3U	V18U	➡ TB3U
22	Travel from shuttle car buffer area TB3U to barge cell V19U	TB3U	➡ V19U
23	Move (EC) container from barge cell V19U to shuttle car buffer area TB2U	V19U	➡ TB2U
24	Travel from shuttle car buffer area TB2U to shuttle car B	TB2U	➡ B
25	Move (FC) container from shuttle car B to barge cell V22L	B	➡ V22L



STEP	OPERATION		
26	Travel from barge cell V22L to barge cell V20U	V22L	→ V20U
27	Move (EC) container from barge cell V20U to shuttle car B	V20U	→ B
28	Travel from shuttle car B to barge cell V17L	B	→ V17L
29	Move (EC) container from barge cell V17L to shuttle car buffer area TB1L	V17L	→ TB1L
30	Travel from shuttle car buffer area TB1L to shuttle car C	TB1U	→ C
31	Move (FC) container from shuttle car C to barge cell V23L	C	→ V23L
32	Travel from barge cell V23L to barge cell V18L	V23L	→ V18L
33	Move (EC) container from barge cell V18L to shuttle car C	V18L	→ C
34	Travel from shuttle car C to shuttle car A	C	→ A
35	Move (FC) container from shuttle car A to barge cell V24L	A	→ V24L
36	Travel from barge cell V24L to barge cell V19L	V24L	→ V19L
37	Move (EC) container from barge cell V19L to shuttle car A	V19L	→ A
38	Travel from shuttle car A to shuttle car B	A	→ B
39	Move (FC) container from shuttle car B to barge cell V21U	B	→ V21U
40	Travel from barge cell V21U to barge cell V20L	V21U	→ V20L
41	Move (EC) container from barge cell V20L to shuttle car B	V20L	→ B
42	Travel from shuttle car B to shuttle car C	B	→ C
43	Move (FC) container from shuttle car C to barge cell V22U	C	→ V22U
44	Travel from barge cell V22U to barge cell V13U	V22U	→ V13U
45	Move (EC) container from barge cell V13U to shuttle car C	V13U	→ C
46	Travel from shuttle car C to shuttle car A	C	→ A
47	Move (FC) container from shuttle car A to barge cell V23U	A	→ V23U
48	Travel from barge cell V23U to barge cell V14U	V23U	→ V14U
49	Move (EC) container from barge cell V14U to shuttle car A	V14U	→ A
50	Travel from shuttle car A to shuttle car B	A	→ B
51	Move (FC) container from shuttle car B to barge cell V24U	B	→ V24U
52	Travel from barge cell V24U to barge cell V15U	V24U	→ V15U
53	Move (EC) container from barge cell V15U to shuttle car B	V15U	→ B

STEP	OPERATION			
54	Travel from shuttle car B to shuttle car C	B	→	C
55	Move (FC) container from shuttle car C to barge cell V17L	C	→	V17L
56	Travel from barge cell V17L to barge cell V16U	V17L	→	V16U
57	Move (EC) container from barge cell V16U to shuttle car C	V16U	→	C
58	Travel from shuttle car C to shuttle car A	C	→	A
59	Move (FC) container from shuttle car A to barge cell V18L	A	→	V18L
60	Travel from barge cell V18L to barge cell V13L	V18L	→	V13L
61	Move (EC) container from barge cell V13L to shuttle car A	V13L	→	A
62	Travel from shuttle car A to shuttle car B	A	→	B
63	Move (FC) container from shuttle car B to barge cell V19L	B	→	V19L
64	Travel from barge cell V19L to barge cell V14L	V19L	→	V14L
65	Move (EC) container from barge cell V14L to shuttle car B	V14L	→	B
66	Travel from shuttle car B to shuttle car C	B	→	C
67	Move (FC) container from shuttle car C to barge cell V20L	C	→	V20L
68	Travel from barge cell V20L to barge cell V15L	V20L	→	V15L
69	Move (EC) container from barge cell V15L to shuttle car C	V15L	→	C
70	Travel from shuttle car C to shuttle car A	C	→	A
71	Move full container (FC) from shuttle car A to barge cell V17U	A	→	V17U
72	Travel from barge cell V17U to barge cell V16L	V17U	→	V16L
73	Move (EC) container from barge cell V16L to shuttle car A	V16L	→	A
74	Travel from shuttle car A to shuttle car B	A	→	B
75	Move (FC) container from shuttle car B to barge cell V18U	B	→	V18U
76	Travel from barge cell V18U to barge cell V9U	V18U	→	V9U
77	Move (EC) container from barge cell V9U to shuttle car B	V9U	→	B
78	Travel from shuttle car B to shuttle car C	B	→	C
79	Move (FC) container from shuttle car C to barge cell V19U	C	→	V19U
80	Travel from barge cell V19U to barge cell V10U	V19U	→	V10U
81	Move (EC) container from barge cell V10U to shuttle car C	V10U	→	C

<i><b>STEP</b></i>	<i><b>OPERATION</b></i>			
82	Travel from shuttle car C to shuttle car A	C	→	A
83	Move (FC) container from shuttle car A to barge cell V20U	A	→	V20U
84	Travel from barge cell V20U to barge cell V11U	V20U	→	V11U
85	Move (EC) container from barge cell V11U to shuttle car A	V11U	→	A
86	Travel from shuttle car A to shuttle car B	A	→	B
87	Move (FC) container from shuttle car B to barge cell V13L	B	→	V13L
88	Travel from barge cell V13L to barge cell V12U	V13L	→	V12U
89	Move (EC) container from barge cell V12U to shuttle car B	V12U	→	B
90	Travel from shuttle car B to shuttle car C	B	→	C
91	Move (FC) container from shuttle car C to barge cell V14L	C	→	V14L
92	Travel from barge cell V14L to barge cell V9L	V14L	→	V9L
93	Move (EC) container from barge cell V9L to shuttle car C	V9L	→	C
94	Travel from shuttle car C to shuttle car A	C	→	A
95	Move (FC) container from shuttle car A to barge cell V15L	A	→	V15L
96	Travel from barge cell V15L to barge cell V10L	V15L	→	V10L
97	Move (EC) container from barge cell V10L to shuttle car A	V10L	→	A
98	Travel from shuttle car A to shuttle car B	A	→	B
99	Move (FC) container from shuttle car B to barge cell V16L	B	→	V16L
100	Travel from V16L to barge cell V11L	V16L	→	V11L
101	Move (EC) container from barge cell V11L to shuttle car B	V11L	→	B
102	Travel from shuttle car B to shuttle car C	B	→	C
103	Move (FC) container from shuttle car C to barge cell V13U	C	→	V13U
104	Travel from barge cell V13U to barge cell V12L	V13U	→	V12L
105	Move (EC) container from barge cell V12L to shuttle car C	V12L	→	C
106	Travel from shuttle car C to shuttle car A	C	→	A
107	Move (FC) container from shuttle car A to barge cell V14U	A	→	V14U
108	Travel from barge cell V14U to barge cell V5U	V14U	→	V5U
109	Move (EC) container from barge cell V5U to shuttle car A	V5U	→	A

STEP	OPERATION	A	→	B
110	Travel from shuttle car A to shuttle car B	A	→	B
111	Move (FC) container from shuttle car B to barge cell V15U	B	→	V15U
112	Travel from barge cell V15U to barge cell V6U	V15U	→	V6U
113	Move (EC) container from barge cell V6U to shuttle car B	V6U	→	B
114	Travel from shuttle car B to shuttle car C	B	→	C
115	Move (FC) container from shuttle car C to barge cell V16U	C	→	V16U
116	Travel from barge cell V16U to barge cell V7U	V16U	→	V7U
117	Move (EC) container from barge cell V7U to shuttle car C	V7U	→	C
118	Travel from shuttle car C to shuttle car A	C	→	A
119	Move (FC) container from shuttle car A to barge cell V9L	A	→	V9L
120	Travel from barge cell V9L to barge cell V8U	V9L	→	V8U
121	Move (EC) container from barge cell V8U to shuttle car A	V8U	→	A
122	Travel from shuttle car A to shuttle car B	A	→	B
123	Move (FC) container from shuttle car B to barge cell V10L	B	→	V10L
124	Travel from barge cell V10L to barge cell V5L	V10L	→	V5L
125	Move (EC) container from barge cell V5L to shuttle car B	V5L	→	B
126	Travel from shuttle car B to shuttle car C	B	→	C
127	Move (FC) container from shuttle car C to barge cell V11L	C	→	V11L
128	Travel from barge cell V11L to barge cell V6L	V11L	→	V6L
129	Move (EC) container from barge cell V6L to shuttle car C	V6L	→	C
130	Travel from shuttle car C to shuttle car A	C	→	A
131	Move (FC) container from shuttle car A to barge cell V12L	A	→	V12L
132	Travel from barge cell V12L to barge cell V7L	V12L	→	V7L
133	Move (EC) container from barge cell V7L to shuttle car A	V7L	→	A
134	Travel from shuttle car A to shuttle car B	A	→	B
135	Move (FC) container from shuttle car B to barge cell V9U	B	→	V9U
136	Travel from barge cell V9U to barge cell V8L	V9U	→	V8L
137	Move (EC) container from barge cell V8L to shuttle car B	V8L	→	B

<b>STEP</b>	<b>OPERATION</b>		
138	Travel from shuttle car B to shuttle car C	B	→ C
139	Move (FC) container from shuttle car C to barge cell V10U	C	→ V10U
140	Travel from barge cell V10U to barge cell V1U	V10U	→ V1U
141	Move (EC) container from barge cell V1U to shuttle car C	V1U	→ C
142	Travel from shuttle car C to shuttle car A	C	→ A
143	Move (FC) container from shuttle car A to barge cell V11U	A	→ V11U
144	Travel from barge cell V11U to barge cell V2U	V11U	→ V2U
145	Move (EC) container from barge cell V2U to shuttle car A	V2U	→ A
146	Travel from shuttle car A to shuttle car B	A	→ B
147	Move (FC) container from shuttle car B to barge cell V12U	B	→ V12U
148	Travel from barge cell V12U to barge cell V3U	V12U	→ V3U
149	Move (EC) container from barge cell V3U to shuttle car B	V3U	→ B
150	Travel from shuttle car B to shuttle car C	B	→ C
151	Move (FC) container from shuttle car C to barge cell V5L	C	→ V5L
152	Travel from barge cell V5L to barge cell V4U	V5L	→ V4U
153	Move (EC) container from barge cell V4U to shuttle car C	V4U	→ C
154	Travel from shuttle car C to shuttle car A	C	→ A
155	Move (FC) container from shuttle car A to barge cell V6L	A	→ V6L
156	Travel from barge cell V6L to barge cell V1L	V6L	→ V1L
157	Move (EC) container from barge cell V1L to shuttle car A	V1L	→ A
158	Travel from shuttle car A to shuttle car B	A	→ B
159	Move (FC) container from shuttle car B to barge cell V7L	B	→ V7L
160	Travel from barge cell V7L to barge cell V2L	V7L	→ V2L
161	Move (EC) container from barge cell V2L to shuttle car B	V2L	→ B
162	Travel from shuttle car B to shuttle car C	B	→ C
163	Move (FC) container from shuttle car C to barge cell V8L	C	→ V8L
164	Travel from barge cell V8L to barge cell V3L	V8L	→ V3L
165	Move (EC) container from barge cell V3L to shuttle car C	V3L	→ C

STEP	OPERATION		
166	Travel from shuttle car C to shuttle car A	C	→ A
167	Move (FC) container from shuttle car A to barge cell V5U	A	→ V5U
168	Travel from barge cell V5U to barge cell V4L	V5U	→ V4L
169	Move (EC) container from barge cell V4L to shuttle car A	V4L	→ A
170	Travel from shuttle car A to shuttle car B	A	→ B
171	Move (FC) container from shuttle car B to barge cell V6U	B	→ V6U
172	Travel from barge cell V6U to shuttle car buffer area TB1U	V6U	→ TB1U
173	Move (EC) container from shuttle car buffer area TB1U to shuttle car B	TB1U	→ B
174	Travel from shuttle car B to shuttle car C	B	→ C
175	Move (FC) container from shuttle car C to barge cell V7U	C	→ V7U
176	Travel from barge cell V7U to shuttle car buffer area TB1L	V7U	→ TB1L
177	Move (EC) container from shuttle car buffer area TB1L to shuttle car C	TB1L	→ C
178	Travel from shuttle car C to shuttle car A	C	→ A
179	Move (FC) container from shuttle car A to barge cell V8U	A	→ V8U
180	Travel from barge cell V8U to shuttle car buffer area TB2U	V8U	→ TB2U
181	Move (EC) container from shuttle car buffer area TB2U to shuttle car A	TB2U	→ A
182	Travel from shuttle car A to shuttle car B	A	→ B
183	Move (FC) container from shuttle car B to barge cell V1L	B	→ V1L
184	Travel from barge cell V1L to shuttle car buffer area TB2L	V1L	→ TB2L
185	Move (EC) container from shuttle car buffer area TB2L to shuttle car B	TB2L	→ B
186	Travel from shuttle car B to shuttle car C	B	→ C
187	Move (FC) container from shuttle car C to barge cell V2L	C	→ V2L
188	Travel from barge cell V2L to shuttle car buffer area TB3U	V2L	→ TB3U
189	Move (EC) container from shuttle car buffer area TB3U to shuttle car C	TB3U	→ C
190	Travel from shuttle car C to shuttle car A	C	→ A
191	Move (FC) container from shuttle car A to barge cell V3L	A	→ V3L
192	Travel from barge cell V3L to shuttle car buffer area TB3L	V3L	→ TB3L
193	Move (EC) container from shuttle car buffer area TB3L to shuttle car A	TB3L	→ A

STEP	OPERATION		
194	Travel from shuttle car A to shuttle car B	A	→
195	Move (FC) container from shuttle car B to barge cell V4L	B	→
196	Travel from barge cell V4L to shuttle car buffer area TB4U	V4L	→
197	Move (EC) container from shuttle car buffer area TB4U to shuttle car B	TB4U	→
198	Travel from shuttle car B to shuttle car C	B	→
199	Move (FC) container from shuttle car C to barge cell V1U	C	→
200	Travel from barge cell V1U to shuttle car buffer area TB4L	V1U	→
201	Move (EC) container from shuttle car buffer area TB4L to shuttle car C	TB4L	→
202	Travel from shuttle car C to shuttle car A	C	→
203	Move (FC) container from shuttle car A to barge cell V2U	A	→
204	Travel from barge cell V2U to buffer area B21U	V2U	→
205	Move (EC) container from buffer area B21U to shuttle car A	B21U	→
206	Travel from shuttle car A to shuttle car B	A	→
207	Move (FC) container from shuttle car B to barge cell V3U	B	→
208	Travel from barge cell V3U to buffer area B21L	V3U	→
209	Move (EC) container from buffer area B21L to shuttle car B	B21L	→
210	Travel from shuttle car B to shuttle car C	B	→
211	Move (FC) container from shuttle car C to barge cell V4U	C	→

## Sequence 2 Crane 2 Operations during Shifting Of 1st Barge

STEP	OPERATION		
1	Travel from barge cell V4U to buffer area B22U	V4U	→ B22U
2	Move (EC) container from buffer area B22U to shuttle car C	B22U	→ C
3	Travel from shuttle car C to shuttle car A	C	→ A
4	Move (FC) container from shuttle car A to buffer area B21L	A	→ B21L
5	Travel from buffer area B21L to buffer area B22L	B21L	→ B22L
6	Move (EC) container from buffer area B22L to shuttle car A	B22L	→ A
7	Travel from shuttle car A to shuttle car B	A	→ B
8	Move (FC) container from shuttle car B to buffer area B21U	B	→ B21U
9	Travel from buffer area B21U to buffer area B23U	B21U	→ B23U
10	Move (EC) container from buffer area B23U to shuttle car B	B23U	→ B
11	Travel from shuttle car B to shuttle car C	B	→ C
12	Move (FC) container from shuttle car C to buffer area B22L	C	→ B22L
13	Travel from buffer area B22L to buffer area B23L	B22L	→ B23L
14	Move (EC) container from buffer area B23L to shuttle car C	B23L	→ C
15	Travel from shuttle car C to shuttle car A	C	→ A
16	Move (FC) container from shuttle car A to buffer area B22U	A	→ B22U
17	Travel from buffer area B22U to buffer area B24U	B22U	→ B24U
18	Move (EC) container from buffer area B24U to shuttle car A	B24U	→ A
19	Travel from shuttle car A to shuttle car B	A	→ B
20	Move (FC) container from shuttle car B to buffer area B23L	B	→ B23L
21	Travel from buffer area B23L to buffer area B24L	B23L	→ B24L
22	Move (EC) container from buffer area B24L to shuttle car B	B24L	→ B
23	Travel from shuttle car B to shuttle car C	B	→ C
24	Move (FC) container from shuttle car C to buffer area B23U	C	→ B23U
25	Travel from buffer area B23U to buffer area B17U	B23U	→ B17U



STEP	OPERATION		
26	Move (EC) container from buffer area B17U to shuttle car C	B17U	→ C
27	Travel from shuttle car C to shuttle car A	C	→ A
28	Move (FC) container from shuttle car A to buffer area B24L	A	→ B24L
29	Travel from buffer area B24L to buffer area B17L	B24L	→ B17L
30	Move (EC) container from buffer area B17L to shuttle car A	B17L	→ A
31	Travel from shuttle car A to shuttle car B	A	→ B
32	Move (FC) container from shuttle car B to buffer area B24U	B	→ B24U
33	Travel from buffer area B24U to buffer area B18U	B24U	→ B18U
34	Move (EC) container from buffer area B18U to shuttle car B	B18U	→ B
35	Travel from shuttle car B to shuttle C	B	→ C
36	Move (FC) container from shuttle car C to buffer area B17L	C	→ B17L
37	Travel from buffer area B17L to buffer area B18L	B17L	→ B18L
38	Move (EC) container from buffer area B18L to shuttle car C	B18L	→ C
39	Travel from shuttle car C to shuttle car A	C	→ A
40	Move (FC) container from shuttle car A to buffer area B17U	A	→ B17U
41	Travel from buffer area B17U to buffer area B19U	B17U	→ B19U
42	Move (EC) container from buffer area B19U to shuttle car A	B19U	→ A
43	Travel from shuttle car A to shuttle car B	A	→ B
44	Move (FC) container from shuttle car B to buffer area B18L	B	→ B18L
45	Travel from buffer area B18L to buffer area B19L	B18L	→ B19L
46	Move (EC) container from buffer area B19L to shuttle car B	B19L	→ B
47	Travel from shuttle car B to shuttle car C	B	→ C
48	Move (FC) container from shuttle car C to buffer area B18U	C	→ B18U
49	Travel from buffer area B18U to buffer area B20U	B18U	→ B20U
50	Move (EC) container from buffer area B20U to shuttle car C	B20U	→ C
51	Travel from shuttle car C to shuttle car A	C	→ A
52	Move (FC) container from shuttle car A to buffer area B19L	A	→ B19L
53	Travel from buffer area B19L to buffer area B20L	B19L	→ B20L

STEP	OPERATION		
54	Move (EC) container from buffer area B20L to shuttle car A	B20L	→ A
55	Travel from shuttle car A to shuttle car B	A	→ B
56	Move (FC) container from shuttle car B to buffer area B19U	B	→ B19U
57	Travel from buffer area B19U to buffer area B14U	B19U	→ B14U
58	Move (EC) container from buffer area B14U to shuttle car B	B14U	→ B
59	Travel from shuttle car B to shuttle car C	B	→ C

## Sequence 3 Crane 2 Operation 2nd Barge Moored At Position 1

<i>STEP</i>	<i>OPERATION</i>		
1	Move (FC) container from shuttle car B to buffer area B20L	C	→ B20L
2	Travel from buffer area B20L to barge cell V21U	B20L	→ V21U
3	Move (EC) container from barge cell V21U to shuttle car C	V21U	→ C
4	Travel from shuttle car C to barge cell V22U	C	→ V22U
5	Move (EC) container from barge cell V22U to shuttle car buffer area TB1L	V22U	→ TB1L
6	Travel from shuttle car buffer area TB1L to shuttle car A	TB1L	→ A
7	Move (FC) container from shuttle car A to buffer area B20U	A	→ B20U
8	Travel from buffer area B20U to barge cell V23U	B20U	→ V23U
9	Move (EC) container from barge cell V23U to shuttle car A	V23U	→ A
10	Travel from shuttle car A to barge cell V24U	A	→ V24U
11	Move (EC) container from barge cell V24U to shutter car buffer area TB2L	V24U	→ TB2L
12	Travel from shutter car buffer area TB2L to shuttle car B	TB2L	→ B
13	Move (FC) container from shuttle car B to shutter car buffer area TB4L	B	→ TB4L
14	Travel from shuttle car buffer area TB4L to barge cell V21L	TB4L	→ V21L
15	Move (EC) container from barge cell V21L to shuttle car B	V21L	→ B
16	Travel from shuttle car B to barge cell V22L	B	→ V22L
17	Move (EC) container from barge cell V22L to shuttle car buffer area TB1U	V22L	→ TB1U
18	Travel from shuttle car buffer area TB1U to shuttle car C	TB1U	→ C
19	Move (FC) container from shuttle car C to barge cell V21L	C	→ V21L
20	Travel from barge cell V21L to barge cell V23L	V21L	→ V23L
21	Move (EC) container from barge cell V23L to shuttle car C	V23L	→ C
22	Travel from shuttle car C to barge cell V24L	C	→ V24L
23	Move (EC) container from barge cell V24L to shuttle car buffer area TB2U	V24L	→ TB2U
24	Travel from shuttle car buffer area TB2U to shuttle car A	TB2U	→ A
25	Move (FC) container from shuttle car A to barge cell V22L	A	→ V22L

STEP	OPERATION		
26	Travel from barge cell V22L to barge cell V17U	V22L	→ V17U
27	Move (EC) container from barge cell V17U to shuttle car A	V17U	→ A
28	Travel from shuttle car A to barge cell V18U	A	→ V18U
29	Move (EC) container from barge cell V18U to shuttle car buffer area TB3L	V18U	→ TB3L
30	Travel from shuttle car buffer area TB3L to barge cell V19U	TB3L	→ V19U
31	Move (EC) container from barge cell V19U to shuttle car buffer area TB3U	V19U	→ TB3U
32	Travel from shuttle car buffer area TB3U to shuttle car B	TB3U	→ B
33	Move (FC) container from shuttle car B to barge cell V23L	B	→ V23L
34	Travel from barge cell V23L to barge cell V20U	V23L	→ V20U
35	Move (EC) container from barge cell V20U to shuttle car B	V20U	→ B
36	Travel from shuttle car B to barge cell V17L	B	→ V17L
37	Move (EC) container from barge cell V17L to buffer area B14U	V17L	→ B14U
38	Travel from buffer area B14U to shuttle car C	B14U	→ C
39	Move (FC) container from shuttle car C to barge cell V24L	C	→ V24L
40	Travel from barge cell V24L to barge cell V18L	V24L	→ V18L
41	Move (EC) container from barge cell V18L to shuttle car C	V18L	→ C
42	Travel from shuttle car C to shuttle car buffer area TB4L	C	→ TB4L
43	Move (FC) container from shuttle car buffer area TB4L to barge cell V21U	TB4L	→ V21U
44	Travel from barge cell V21U to shuttle car A	V21U	→ A
45	Move (FC) container from shuttle car A to barge cell V22U	A	→ V22U
46	Travel from barge cell V22U to barge cell V19L	V22U	→ V19L
47	Move (EC) container from barge cell V19L to shuttle car A	V19L	→ A
48	Travel from shuttle car A to barge cell V20L	A	→ V20L
49	Move (FC) container from barge cell V20L to shuttle car buffer area TB4L	V20L	→ TB4L
50	Travel from shuttle car buffer area TB4L to shuttle car B	TB4L	→ B
51	Move (FC) container from shuttle car B to barge cell V23U	B	→ V23U
52	Travel from barge cell V23U to barge cell V13U	V23U	→ V13U
53	Move (EC) container from barge cell V13U to shuttle car B	V13U	→ B

STEP	OPERATION		
54	Travel from shuttle car B to buffer area B17U	B	→ B17U
55	Move (FC) container from buffer area B17U to barge cell V24U	B17U	→ V24U
56	Travel from barge cell V24U to barge cell V14U	V24U	→ V14U
57	Move (EC) container from barge cell V14U to shuttle car buffer area TB4U	V14U	→ TB4U
58	Travel from shuttle car buffer area TB4U to shuttle car C	TB4U	→ C
59	Move (FC) container from shuttle car C to barge cell V17L	C	→ V17L
60	Travel from barge cell V17L to barge cell V15U	V17L	→ V15U
61	Move (EC) container from barge cell V15U to shuttle car C	V15U	→ C
62	Travel from shuttle car C to buffer area B17L	C	→ B17L
63	Move (FC) container from buffer area B17L to barge cell V18L	B17L	→ V18L
64	Travel from barge cell V18L to shuttle car A	V18L	→ A
65	Move (FC) container from shutter car A to barge cell V19L	A	→ V19L
66	Travel from barge cell V19L to barge cell V16U	V19L	→ V16U
67	Move (EC) container from barge cell V16U to shuttle car A	V16U	→ A
68	Travel from shuttle car A to buffer area B18U	A	→ B18U
69	Move (FC) container from buffer area B18U to barge cell V20L	B18U	→ V20L
70	Travel from barge cell V20L to barge cell V13L	V20L	→ V13L
71	Move (EC) container from barge cell V13L to buffer area B17L	V13L	→ B17L
72	Travel from buffer area B17L to shuttle car B	B17L	→ B
73	Move (FC) container from shuttle car B to barge cell V17U	B	→ V17U
74	Travel from barge cell V17U to barge cell V14L	V17U	→ V14L
75	Move (EC) container from barge cell V14L to shuttle car B	V14L	→ B
76	Travel from shuttle car B to buffer area B18L	B	→ B18L
77	Move (FC) container from buffer area B18L to barge cell V18U	B18L	→ V18U
78	Travel from barge cell V18U to shuttle car C	V18U	→ C
79	Move (FC) container from shuttle car C to barge cell V19U	C	→ V19U
80	Travel empty crane from barge cell V19U to barge cell V15L	V19U	→ V15L
81	Move (EC) container from barge cell V15L shuttle car C	V15L	→ C

STEP	OPERATION		
82	Travel from shuttle car C to barge cell V16L	C	→ V16L
83	Move (EC) container from barge cell V16L to buffer area B17U	V16L	→ B17U
84	Travel from buffer area B17U to shuttle car A	B17U	→ A
85	Move (FC) container from shuttle car A to barge cell V20U	A	→ V20U
86	Travel from barge cell V20U to barge cell V9U	V20U	→ V9U
87	Move (EC) container from barge cell V9U to shuttle car A	V9U	→ A
88	Travel from shuttle car A to buffer area B21U	A	→ B21U
89	Move (FC) container from buffer area B21U to barge cell V13L	B21U	→ V13L
90	Travel from barge cell V13L to barge cell V10U	V13L	→ V10U
91	Move (EC) container from barge cell V10U to buffer area B18L	V10U	→ B18L
92	Travel from buffer area B18L to shuttle car B	B18L	→ B
93	Move (FC) container from shuttle car B to barge cell V14L	B	→ V14L
94	Travel from barge cell V14L to barge cell V11U	V14L	→ V11U
95	Move (EC) container from barge cell V11U to shuttle car B	V11U	→ B
96	Travel from shuttle car B to buffer area B21L	B	→ B21L
97	Move (FC) container from buffer area B21L to barge cell V15L	B21L	→ V15L
98	Travel from barge cell V15L to shuttle car C	V15L	→ C
99	Move (FC) container from shuttle car C to barge cell V16L	C	→ V16L
100	Travel from barge cell V16L to barge cell V12U	V16L	→ V12U
101	Move (EC) container from barge cell V12U to shuttle car C	V12U	→ C
102	Travel from shuttle car C to barge cell V9L	C	→ V9L
103	Move (EC) container from barge cell V9L to buffer area B21L	V9L	→ B21L
104	Travel from buffer area B21L to buffer area B22U	B21L	→ B22U
105	Move (FC) container from buffer area B22U to barge cell V13U	B22U	→ V13U
106	Travel from barge cell V13U to shuttle car A	V13U	→ A
107	Move (FC) container from shuttle car A to barge cell V14U	A	→ V14U
108	Travel from barge cell V14U to barge cell V10L	V14U	→ V10L
109	Move (EC) container from barge cell V10L to shuttle car A	V10L	→ A

STEP	OPERATION		
110	Travel from shuttle car A to barge cell V11L	A	→ V11L
111	Move (EC) container from barge cell V11L to buffer area B21U	V11L	→ B21U
112	Travel from buffer area B21U to shuttle car B	B21U	→ B
113	Move (FC) container from shuttle car B to barge cell V15U	B	→ V15U
114	Travel from barge cell V15U to barge cell V12L	V15U	→ V12L
115	Move (EC) container from barge cell V12L to shuttle car B	V12L	→ B
116	Travel from shuttle car B to buffer area B22L	B	→ B22L
117	Move (FC) container from buffer area B22L to barge cell V16U	B22L	→ V16U
118	Travel from barge cell V16U to shuttle car C	V16U	→ C
119	Move (FC) container from shuttle car C to barge cell V9L	C	→ V9L
120	Travel from barge cell V9L to barge cell V5U	V9L	→ V5U
121	Move (EC) container from barge cell V5U to shuttle car C	V5U	→ C
122	Travel from shuttle car C to barge cell V6U	C	→ V6U
123	Move (EC) container from barge cell V6U to buffer area B22L	V6U	→ B22L
124	Travel from buffer area B22L to shuttle car A	B22L	→ A
125	Move (FC) container from shuttle car A to barge cell V10L	A	→ V10L
126	Travel from barge cell V10L to barge cell V7U	V10L	→ V7U
127	Move (EC) container from barge cell V7U to shuttle car A	V7U	→ A
128	Travel from shuttle car A to buffer area B23U	A	→ B23U
129	Move (FC) container from buffer area B23U to barge cell V11L	B23U	→ V11L
130	Travel from barge cell V11L to shuttle car B	V11L	→ B
131	Move (FC) container from shuttle car B to barge cell V12L	B	→ V12L
132	Travel from barge cell V12L to barge cell V8U	V12L	→ V8U
133	Move (EC) container from barge cell V8U to shuttle car B	V8U	→ B
134	Travel from shuttle car B to barge cell V5L	B	→ V5L
135	Move (EC) container from barge cell V5L to buffer area B22U	V5L	→ B22U
136	Travel from buffer area B22U to shuttle car C	B22U	→ C
137	Move (EC) container from shuttle car C to barge cell V9U	C	→ V9U

<i>STEP</i>	<i>OPERATION</i>		
138	Travel from barge cell V9U to barge cell V6L	V9U	→ V6L
139	Move (EC) container from barge cell V6L to shuttle car C	V6L	→ C
140	Travel from shuttle car C to buffer area B23L	C	→ B23L
141	Move (FC) container from buffer area B23L to barge cell V10U	B23L	→ V10U
142	Travel from barge cell V10U to barge cell V7L	V10U	→ V7L
143	Move (EC) container from barge cell V7L to buffer area B23L	V7L	→ B23L
144	Travel from buffer area B23L to shuttle car A	B23L	→ A
145	Move (FC) container from shuttle car A to barge cell V11U	A	→ V11U
146	Travel from barge cell V11U to barge cell V8L	V11U	→ V8L
147	Move (EC) container from barge cell V8L to shuttle car A	V8L	→ A
148	Travel from shuttle car buffer A to buffer area B24U	A	→ B24U
149	Move (FC) container from buffer area B24U to barge cell V12U	B24U	→ V12U
150	Travel from barge cell V12U to shuttle car B	V12U	→ B
151	Move (FC) container from shuttle car B to barge cell V5L	B	→ V5L
152	Travel from barge cell V5L to barge cell V1U	V5L	→ V1U
153	Move (EC) container from barge cell V1U to shuttle car B	V1U	→ B
154	Travel from shuttle car B to buffer area B24L	B	→ B24L
155	Move (FC) container from buffer area B24L to barge cell V6L	B24L	→ V6L
156	Travel from barge cell V6L to shuttle car C	V6L	→ C
157	Move (FC) container from shuttle car C to barge cell V7L	C	→ V7L
158	Travel from barge cell V7L to shuttle car buffer area TB1U	V7L	→ TB1U
159	Move (EC) container from shuttle car buffer area TB1U to shuttle car C	TB1U	→ C
160	Travel from shuttle car C to buffer area B19U	C	→ B19U
161	Move (FC) container from buffer area B19U to barge cell V8L	B19U	→ V8L
162	Travel from barge cell V8L to shuttle car A	V8L	→ A
163	Move (FC) container from shuttle car A to barge cell V5U	A	→ V5U
164	Travel from barge cell V5U to barge cell V2U	V5U	→ V2U
165	Move (EC) container from barge cell V2U to shuttle car A	V2U	→ A



STEP	OPERATION		
166	Travel from shuttle car A to buffer area B19L	A	→ B19L
167	Move (FC) container from buffer area B19L to barge cell V6U	B19L	→ V6U
168	Travel from barge cell V6U to shuttle car B	V6U	→ B
169	Move (FC) container from shuttle car B to barge cell V7U	B	→ V7U
170	Travel from barge cell V7U to barge cell V3U	V7U	→ V3U
171	Move (EC) container from barge cell V3U to shuttle car B	V3U	→ B
172	Travel from shuttle car B to barge cell V4U	B	→ V4U
173	Move (EC) container from barge cell V4U to buffer area B23U	V4U	→ B23U
174	Travel from buffer area B23U to shuttle car C	B23U	→ C
175	Move (FC) container from shuttle car C to barge cell V8U	C	→ V8U
176	Travel from barge cell V8U to barge cell V1L	V8U	→ V1L
177	Move (EC) container from barge cell V1L to shuttle car C	V1L	→ C
178	Travel from shuttle car C to barge cell V2L	C	→ V2L
179	Move (EC) container from barge cell V2L to buffer area B24L	V2L	→ B24L
180	Travel from buffer area B24L to shuttle car A	B24L	→ A
181	Move (FC) container from shuttle car A to barge cell V1L	A	→ V1L
182	Travel from barge cell V1L to barge cell V3L	V1L	→ V3L
183	Move (EC) container from barge cell V3L to shuttle car A	V3L	→ A
184	Travel from shuttle car A to buffer area B20U	A	→ B20U
185	Move (FC) container from buffer area B20U to barge cell V2L	B20U	→ V2L
186	Travel from to barge cell V2L to shuttle car B	V2L	→ B
187	Move (FC) container from shuttle car B to barge cell V3L	B	→ V3L
188	Travel from barge cell V3L to barge cell V4L	V3L	→ V4L
189	Move (EC) container from barge cell V4L to shuttle car B	V4L	→ B
190	Travel from shuttle car B to buffer area B20L	B	→ B20L
191	Move (FC) container from buffer area B20L to barge cell V4L	B20L	→ V4L
192	Travel from barge cell V4L to shuttle car C	V4L	→ C
193	Move (FC) container from shuttle car C to barge cell V1U	C	→ V1U

STEP	OPERATION		
194	Travel from barge cell V1U to shuttle car buffer area TB1L	V1U	→ TB1L
195	Move (EC) container from shuttle car buffer area TB1L to shuttle car C	TB1L C	→ C
196	Travel from shuttle car C to shuttle car buffer area TB2U	TB2U	→ TB2U
197	Move (EC) container from shuttle car buffer area TB2U to buffer area B24U	B24U	→ B24U
198	Travel from buffer area B24U to shuttle car buffer area TB2L	TB2L	→ TB2L
199	Move (EC) container from shuttle car buffer area TB2L to buffer area B18U	B18U	→ B18U
200	Travel from buffer area B18U to shuttle car A	A	→ A
201	Move (FC) container from shuttle car A to barge cell V2U	V2U	→ V2U
202	Travel from barge cell V2U to shuttle car buffer area TB3U	TB3U	→ TB3U
203	Move (EC) container from shuttle car buffer area TB3U to buffer area B20L	B20L	→ B20L
204	Travel from buffer area B20L to shuttle car buffer area TB3L	TB3L	→ TB3L
205	Move (EC) container from shuttle car buffer area TB3L to buffer area B20U	B20U	→ B20U
206	Travel from buffer area B20U to shuttle car B	B	→ B
207	Move (FC) container from shuttle car B to barge cell V3U	V3U	→ V3U
208	Travel from barge cell V3U to shuttle car buffer area TB4U	TB4U	→ TB4U
209	Move (EC) container from shuttle car buffer area TB4U to buffer area B19L	B19L	→ B19L
210	Travel from buffer area B19L to shuttle car buffer area TB4L	TB4L	→ TB4L
211	Move (EC) container from shuttle car buffer area TB4L to buffer area B19U	B19U	→ B19U
212	Travel from buffer area B19U to shuttle car C	C	→ C
213	Move (FC) container from shuttle car C to barge cell V4U	V4U	→ V4U

## 2.12 GENERAL TESTING REQUIREMENTS

- A. Each crane shall be fully assembled and fully load tested at the manufacturer's plant. Both cranes shall be load tested on site after installation in accordance with Section 01811 - Preliminary and Field Tests and as specified herein.
- B. All major components and sub assemblies shall be shop tested.
- C. Nothing stated herein shall affect the requirements contained in Section 01415 - Miscellaneous Requirements and Section 01451 - Contractor's Quality Control.
- D. During crane testing, hoist drives, trolley drives, gantry drives and the spreader HPU shall be operated under their own power. The test shall use the actual motor controls and operated from the operator's cab. All reeving of drums and sheaves will be required to test the spreader and special features of the cranes.
- E. Programming of the crane positioning system, height detection system and spreader features (height sensing and noise reduction) shall be installed and shop tested to demonstrate that they can satisfactorily perform these functions without major malfunctions. Only minor and final adjustments will be permitted during field and acceptance tests.
- F. The anti-collision system and all safety devices including the gantry slow down and stop limit switches shall be active during the tests to demonstrate their ability to function satisfactorily.
- G. CCTV cameras and floodlights shall be activated.
- H. Each crane shall be videotaped during complete field testing as directed by the Engineer.
- I. Operating current measurements for no load and load tests shall be recorded for electrical equipment (motors and coils) using appropriate instrumentation. Speed measurements shall be recorded.
- J. Recorded values; abnormal differences shall be explained in the remarks and submitted for approval or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected.
- K. With the trolley and gantry drives at slow speed, the main power source shall be disconnected verifying that the trolley will stop and that the brake will set. The test shall be conducted 3 times.
- L. During the shop test and field test, improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies shall be monitored. Observed defects critical to continued testing shall be reported immediately to the Engineer, and testing shall be suspended until the deficiency is

corrected. During and immediately following each test, the following inspections shall be made:

1. Inspect for evidence of bending, warping, permanent deformation, cracking, or malfunction of structural components.
2. Check for overheating in brake operations; check for proper stopping. All safety devices, including emergency stop switches and "POWER OFF" pushbuttons, shall be tested and inspected separately to barge cell. Verify proper operation of the brakes.
3. Check for abnormal noise or vibration and overheating in machinery drive components.
4. Check electrical drive components for proper operation, freedom from chatter, noise, or overheating.
5. Check that trolley and gantry drivers are synchronized to prevent skewing or racking while operating.
6. Inspect external gears for abnormal wear patterns, damage, or inadequate lubrication.

## 2.13 SHOP TESTS

- A. All permanent conduit and wires shall be installed for the shop test.
- B. In the event that the facility cannot accommodate the total length of the crane rail to travel the gantry, a minimum of seventy five (75) feet will be acceptable to perform the tests. However this does not relieve the Contractor of responsibility for performing this test at the site.
- C. No Load Operational Test
  1. Each crane shall be fully assembled including the spreader and tested without a load. The no load test shall be conducted with an empty refuse container (12 feet H x 20 feet Lg x 8.5 feet W) used for operation at the transfer station. The test shall be conducted for ten (10) complete cycles of operation as follows:
    - a. Hoist/Lower spreader from full up to down position and simultaneously travel trolley or gantry.
    - b. Lower container to ground level and engage and disengage twist locks and flippers during each cycle to simulate container hook up and release.
    - c. Operate spreader side shift feature to simulate positioning of container in both directions.

- d. Actuate trim/list compensation system five (5) degrees in each direction to simulate barge trim position.
- e. Actuate Anti-Sway system and travel gantry and trolley while hoisting/lowering spreader.
- f. Pre-program crane management system to simulate automatic prepositioning of containers, height detection system and noise reduction of spreader.

#### D. Operational Load Test

- 1. The crane shall be subjected to an operational load test by operating the crane through five (5) full cycles of operation at the rated speeds with a certified load of 30 short tons (60,000 pounds) test load. The cranes shall perform the following tests.
  - a. Hoist the test load to assure that the load is supported by the crane and held load by the hoisting brakes.
  - b. Travel the test load by means of the trolley for the full length of the girder in both directions.
  - c. Travel the test load by means of the gantry the full length of the gantry rail in both directions with the trolley and test load at extreme end of the girder (maximum outreach of the crane).
  - d. Lower the test load and stop and hold the load with the brakes during the test.
  - e. Noise level readings shall be recorded and verified in compliance with the noise requirements specified in Part 2, Products, Article 2.04.

### PART 3 EXECUTION

#### 3.01 CRANE INSTALLATION

##### A. General Requirements

- 1. For all installation purposes, the maximum allowed uniform pier load is 600 psf between crane rails for the entire length of the rails with a maximum concentrated load of 15 tons. The maximum allowed uniform pier load along the perimeter between edge of pier to the waterside rail is 100 psf. It is anticipated that fully or partially assembled cranes be unshipped at the South end of the facility. Site bathymetry data, dredge plans and pier arrangements are depicted on the Drawings.

2. The crane manufacturer shall be responsible for all rigging equipment and materials necessary to unship the cranes to the facility fully or partially assembled.
3. The Contractor shall obtain from the manufacturer a crane installation plan and schedule that entails description of crane installation and all rigging mooring required for installation.
4. All devices, equipment and systems furnished under this Contract shall be fabricated and installed so that adequate clearances are provided for operation, maintenance, repair and replacement. It is the Contractor's responsibility to ensure that the crane manufacturer has reviewed the Contract Drawings, conducted a survey of the crane rail installation and conductor bus bar support and ensured that adequate clearances and tolerances are available, and notify the Engineer in the event that such clearances cannot be obtained and tolerances have not been obtained.
5. When field connections are bolted, they shall be made with bolts in holes aligned, drilled and reamed in the shop.
6. All crane structural, mechanical and electrical devices, including panels, junction boxes, limit switches, and accessories, shall be installed.
7. In addition, and before crane Certification is issued, the Contractor shall obtain from the manufacturer certain records, crane test certifications, and other documents, which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit to DSNY all items which are required by the Contract Documents:
  - a. One copy of the crane rail and electrical bus bar support system survey with clearances and tolerances.
  - b. One copy of test procedures and electrical load readings taken during the testing.
8. Crane installation and/or erection shall be photographed in accordance with the General Conditions.

**B. Utilities**

1. The input power supply for the specified cranes is 480 volts and as shown on the Drawings and described elsewhere in the specifications. The Contractor shall provide the primary 480-VAC power required during the installation and testing of the crane.
2. Other temporary electrical power, shall also be supplied by the Contractor.

### 3.02 FIELD TESTING

#### A. General

1. Field testing shall conform to the General Testing Requirements specified in Part 2, Products, Article 2.12.
2. The cranes shall be fully assembled cranes with spreader, electrical conductor bus bar and limit switch assemblies, instrumentation, controls and accessories necessary for the proper functioning of each crane and the operating systems as a whole.
3. The cranes shall operate trouble free for a continuous period of time under load as specified below. If there are any interruptions in operation during the test, the test shall be repeated until the equipment or system operates trouble free for the specified time period.
4. All field tests including equipment and system tests shall be performed in accordance with Sections 13 and 14 of the General Conditions, the requirements of the Specifications and as hereinafter supplemented. The requirements contained herein shall apply, whether or not this Section is specifically referenced elsewhere in the Specifications.
5. All tests required for certification shall be performed to the satisfaction of the certifying agency.

- B. No Load Operation Test: Upon completion and inspection of the crane installation, installation of the electrical conductor bus bar system and the gantry travel limit switches, each crane shall be subjected to a no load, rated load and operational load test as specified below. Upon conducting the test, the crane shall be required to function through full operating ranges in all directions specified. During the test, operation of the travel limit switches, over-travel limit switches, anti-collision system, emergency stop, emergency run switches and limit switch recovery features shall be demonstrated to perform as intended. Operation features for the spreader anti-sway system, automated crane positioning feature, height detection and noise reduction shall also be demonstrated specifically at this time.

#### C. Run-Through Test

1. Run cranes at slow speed and verify clearances and operation of electrical conductor bar rail assembly with collector shoes on cranes. At slow speed verify that all safety devices (limit switches, anti-collision devices, bells, rotating beacons) are active and operational. Travel cranes the full length of the pier through full operating range of varying speeds from 0 to max for 3 complete cycles.
2. Raise and lower the spreaders through full range of hoisting speeds from zero to maximum for 3 complete cycles. Raise spreaders to maximum lift to verify

the two block limit switches and up - stop and down - stop on hoist drum operate satisfactorily. Actuate and operate side shifting feature on spreaders in both directions.

3. The trolley shall travel the full length of the girder at varying speeds from zero to maximum – limit and over travel switches shall be demonstrated.
  4. The spreader flippers, twist lock mechanisms and indicator lights shall be operated through 5 complete cycles to demonstrate that all safety switches and interlocks are operational.
  5. Actuate trim/list/skew feature to demonstrate functionality.
  6. Operate cranes and select random positions to barge cell Verify automatic positioning of crane with barge cell guides, shuttle cars and buffered containers stored on pier.
- D. Rated Load Test: The rated load test shall be performed with a certified test load equal to 75,000 pound (37.5 short tons). The test load shall be used as follows:
1. Hoist the test load to assure that the load is supported by the crane and held load by the hoisting brakes.
  2. Travel the test load by means of the trolley for the full length of the girder in both directions.
  3. Travel the test load by means of the gantry the full length of the gantry rail in both directions with the trolley and test load at extreme end of the girder (maximum outreach of the crane). Verify that no racking of the girders is visible as the gantry is traveling in both directions.
  4. Lower the test load and stop and hold the load with the brakes.
  5. Demonstrate that the features of the crane management system and safety devices are operational and functional during this test.
  6. No excessive overheating, excessive noise or excessive vibration shall occur. After testing, a thorough inspection of the crane shall be conducted to barge cell Verify that there is no permanent set, deformation or other damage to any part of the crane machinery, structure, rigging, or spreader and components.
  7. The crane manufacturer shall supply the test tank/s or certified test weights for testing. This equipment will become the property of City of New York after testing.



**E. Operational Load Test (Acceptance Test)**

1. The cranes shall be subjected to an operational (acceptance) test by operating the cranes through full ranges of operation of motions and speeds with a 30 short ton (60,000 pound) test load container.
2. The test shall include loading/unloading a container from a barge with cell guides to the transfer-car(s) at the land side of the pier. The barge shall be inclined to the maximum adverse inclination to demonstrate the capability of the crane to operate under unfavorable conditions. The crane operator shall perform multiple (simultaneous) operations while the test is being conducted. The test shall be conducted for a period of 16 hours continuous operation while stopping for 30 seconds after each complete cycle.
  - a. The test shall demonstrate the maximum duty cycle for one crane by loading/unloading a loaded container from the furthest most shuttle car and loading it into the lowest/furthest cell on the barge with cell guides.
  - b. The operating time for each cycle shall be recorded and compared to the operating design cycle specified in Part 1, General, Article 1.04. A.
3. The cranes shall operate trouble free for the duration of this test. If there are any interruptions during the test, the test shall be repeated until the equipment on system operates trouble free for the specified time period.
4. During the crane test automatic positioning on the crane management system (CMS) and the height detection and noise reduction systems shall be utilized to demonstrate the automated capability of the crane to lift a selected container from the barge to a selected location on the pier or to a shuttle car. The cranes management system shall also monitor and perform diagnostic checks on systems to detect warnings or malfunctions.
5. The cranes shall be subjected to an emergency stop test by traveling in both directions at full speed with a 30 short tons, (60,000-pound) test load.

**3.03 TRAINING****A. Provide training in accordance with Section 01821 - Training and as follows:**

1. A minimum of 40 hours for crane operations
2. A minimum of 40 hours for crane preventive and scheduled maintenance (electrical)

3. A minimum of 40 hours for crane preventive and scheduled maintenance (mechanical)

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 14695**  
**CONSTANT TENSION MOORING WINCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section defines the requirements for design, manufacture, installation and testing of electric constant tension (CT) mooring winches for mooring barges. The CT winches shall be marine quality as shown on the Contract Drawings and within this specification.
- B. The transfer station will require two (2) CT winches. One (1) winch shall be designated left hand and One (1) shall be right hand. Gearbox enclosures and electrical controls shall be watertight Electrical motors and control equipment shall be as specified in Paragraphs 2.03 A and B and electrical controls shall be watertight. Two (2) additional CT winches, one left hand and one right hand, shall be provided as spares. The two (2) CT winches shall be provided and identified in accordance with Table 1.

Table 1: Constant Tension Winch Quantities and Identification

CT Winch Identification No.	Left/Right Hand Designation
F-CTW-01	Right
F-CTW-02	Left

- C. The CT winches shall be manufactured in accordance with NABRICO model number DF-BMW-CD-02 (right hand) DF-BMW-CD-01 (left hand) or approved equal as shown on the Contract Drawings and this specification.
- D. A complete console with controls and enclosure shall be provided as part of the CT winch manufacturer's delivery in accordance with Section 17320 - SCADA System – Control Panels and Enclosures and Section 17330 – SCADA System – Panel-Mounted Instruments and Devices. The console shall be configured as shown on the drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 - Structural Steel
- B. Section 05500 - Metal Fabrications\
- C. Section 05561 - Miscellaneous Metal Castings
- D. Division 16 - Electrical, various sections
- E. Section 17101 - SCADA System - General Requirements
- F. Section 17230 - SCADA System - HMI Software Requirements
- G. Section 17250 - SCADA System – Plantwide Network Equipment
- H. Section 17270 - SCADA System - Monitoring and Control Criteria

- I. Section 17280 - SCADA System – Input/Output Point list
- J. Section 17320 - SCADA Systems - Control Panels and Enclosures
- K. Section 17330 - SCADA System - Panel-Mounted Instruments and Devices

### 1.03 REFERENCES

#### A. Codes and standards referred to in this section

- 1. AGMA - American Gear Manufacturer Association
- 2. AISC - American Institute of Steel Construction
- 3. ASME - American Society of Mechanical Engineers
- 4. ASTM - American Society for Testing and Materials
- 5. AWS - American Welding Society
- 6. IEEE - Institute for Electrical and Electronic Engineers
- 7. NEC - National Electric Code
- 8. NEMA - National Electrical Manufacturers Association
- 9. SSPC - Society for Protective Coatings
- 10. OSHA - Code of Federal Regulations Occupational Safety and Health Administration

### 1.04 SUBMITTALS

- #### A. Furnish all submittals as specified in Section 01330 - Shop Drawings.

### 1.05 SPARE PARTS

- #### A. Spare parts for CT winches shall be provided in accordance with Division 1 and as follows:

- 1. One (1) complete CT winch, left hand
- 2. One (1) complete CT winch, right hand
- 3. One (1) electric motor in accordance with Paragraph 2.03 A
- 4. One (1) set of electrical controls in accordance with Paragraph 2.03 B
- 5. Two (2) winch drums
- 6. Two (2) complete brake assemblies
- 7. Two (2) sets of brake pads
- 8. Two (2) wire ropes, 300 feet, 1 inch diameter, 6 X 37, EIPS right lay, IWRC, prestressed steel, uncoated
- 9. Two (2) roller chain sprockets (motor)
- 10. Two (2) roller chain sprockets (drum)
- 11. Two (2) roller chains
- 12. Two (2) sets of chain links

### 1.06 WARRANTY

- #### A. The Contractor shall guarantee the material and workmanship of the equipment installed under these specifications and make good any defects not due to ordinary

wear or to improper use which may develop within one year after the completion of the installation or acceptance thereof by beneficial use, whichever is earlier.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide equipment of one of the following manufacturers or an approved equivalent in accordance with Section 01631 – Equivalent Materials and Equipment:

1. Nashville Bridge Company. (Nabrico)  
Division of Trinity Industries, Inc.  
P.O. Box 239  
Nashville, TN 37202  
Tel.: +1 (615) 442-1300  
Fax: +1 (615) 442-1313  
<http://www.nabrico-marine.com>
2. Superior Lidgerwood-Mundy, Corp  
302 Grand Avenue  
P.O. Box 39  
Superior, WI 54880  
Tel.: +1 (715) 394-4444; +1 (888) 511-7922  
Fax: +1 (715) 394-6199  
<http://www.lidgerwood.com>  
Contact: Vicki McCusker
3. Appleton Marine, Inc.  
3030 E. Pershing Street  
P.O. Box 9020  
Appleton, WI 54911-9020  
Tel.: +1 (920) 738-5432  
Fax: +1 (920) 738-5435  
Contact: [sales@appletonmarine.com](mailto:sales@appletonmarine.com)  
<http://www/appletonmarine.com>
4. Markey Machinery Co., Inc.  
4634 East Marginal Way So.  
Suite C-140  
Seattle, WA 98134  
Tel.: +1 (206) 622-4697  
Fax: +1 (206) 623-9839  
Contact: Blaine Dempke, President/Sales –  
[BDempke@markeymachinery.com](mailto:BDempke@markeymachinery.com)  
<http://www.markeymachinery.com>

5. Coastal Marine Equipment, Inc  
20995 Coastal Parkway Gulfport, MS 39503  
Tel: (228) 832-7655 Fax: (228) 832-7675  
Contact: Anthony Gauthier  
anthonyg@coastalmarineequipment.com

## 2.02 CT WINCH SYSTEM AND COMPONENTS

### A. Typical CT winch

1. Width 33 inches
2. Length 69 inches
3. Height 70 inches
4. Weight 7000 lbs (Approximately)

### B. Drum Dimension

1. 18 inches – Diameter
2. 10 inches – Width

### C. wire Capacity

1. 1.0-inch diameter wire rope 6 X 37 Extra Improved Plow Steel (E.I.P.S), Independent Wire Rope Core (I.W.R.C) right lay, pre-stressed steel, uncoated
2. Breaking strength 103,400 lbs
3. 300 feet maximum length

### D. Performance

1. 55,000 lbs. starting line pull @ second layer of drum
2. 40,000 lbs. running line pull @ second layer of drum
3. 0 to 30 fpm-Speed

### E. Operation

1. The two (2) CT winches at the transfer station shall be controlled individually or in unison, locally at either winch or from the Operations Room inside the transfer station.
2. When the barge is at the correct mooring position at the pier, the winch control shall be set to "Automatic" and the motor shall be locked into dynamic holding constant tension mode. As the tension on the line increases, the motor, utilizing dynamic braking, shall allow the winch to pay out only the amount of wire rope necessary to maintain the preset tension. As line tension decreases,

the motor shall sense the slack line and recover the wire, continuing to maintain the preset tension.

3. The CT winch shall be equipped with an automatic safety disc brake and a means to measure the length of line released. Upon reaching a prescribed maximum length of line, the winch shall automatically set the brake, preventing further movement of the barge. The disc brake shall be designed to hold the wire to the breaking strength.
4. The CT winches shall be programmed to allow the following three modes of operation:
  - a. Mode 1 CONSTANT TENSION - Both winches shall be designed to maintain a constant mooring line pull preventing the movement of the barge. The winches shall allow the barge to react to the rise and fall of the tide or draft change without shifting position.
  - b. Mode 2 CONSTANT TENSION DURING BARGE POSITIONING - The winches shall be designed to operate simultaneously, maintaining a constant tension on the mooring lines, with one winch "hauling in" while the other winch "pays out" as directed by the operator. This will allow the barge to be repositioned along the face of the pier as loading requirements change. Control levers (joysticks) located on the control console on each winch and in the Operations Room shall be provided to perform this function. The constant tension of the mooring lines shall keep the barge hard against the pier fenders.
  - c. Mode 3 CONSTANT TENSION OFF - The winches shall be designed to permit independent manual operation to allow barges to be shifted.

#### F. Installation

1. The CT winches shall be installed and oriented left and right hand as shown on the Contract Drawings.
2. Provide mounting flanges suitable for installation as shown on the Contract Drawings.

### 2.03 ELECTRICAL EQUIPMENT

#### A. Electric Motor

1. 40 HP, 480 Volts, 3 ph, 60 Hz
2. Ambient: -20 to +120 Degrees F
3. Duty: Continuous



4. Enclosure: Totally enclosed non-ventilated (TENV), with sealed windings and connection. Motor shall be corrosion resistant when exposed to a salt-water environment.
5. Features: Automatic drain valve, 120 VAC space heater

**B. Electrical Equipment**

1. 40 HP, 480 Volts, 3 ph, 60 Hz
2. Ambient: -20 to +120 Degrees F
3. Duty: Continuous
4. Enclosure: NEMA 4X – Equipment shall operate outdoors in all weather conditions. Enclosure shall be corrosion resistant exposed to a salt-water environment.
5. Equipment designed for indoor use shall be NEMA 12 enclosed, minimum.
6. Features: Motor controller shall have 120 VAC space heater

**C. Controls**

1. CT winches shall be operated individually or in unison from either winch at a local control station or in unison from the Operations Room and shall be configured as shown in the Contract Drawings. The local control panel shall be mounted on the winch by the manufacturer. The Contractor shall fabricate the winch control console and mount the master control panel in place for installation in the Operations Room as shown on the Contract Drawings.
2. CT winch shall be fully adjustable and shall be pre-set to 40,000 lbs tension.
3. Each CT winch shall be designed to detect and relay malfunctions to the primary SCADA system located in the Operations Room.

**2.04 PAINTING**

**A. CT winches shall be coated as follows:**

1. Coating/Painting
  - a. The CT winches shall be painted gloss black with a three (3) part Zinc epoxy painting system as specified herein.

- b. Difficult to spray areas, such as sharp plate edges, shall be power tool broken (chamfered or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
- c. The paint system shall not crack or flake off within the guarantee period. The CT winches shall be coated with durable finishes providing the required colors.

## 2. Surface Preparation

- a. Surfaces shall be thoroughly prepared in accordance with SSPC-SP 10. Oil and grease shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.
- b. Three types of coatings shall be used for the entire winch surfaces. Coatings shall consist of a primer, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - (1) Primer: One coat of Epoxy Zinc rich primer applied at the manufacturer's plant with a dry film thickness of at least 65 microns
  - (2) Intermediate: One coat of Epoxy Micaceous iron oxide applied at the manufacturer's plant with a dry film thickness of at least 140 microns.
  - (3) Finish: Two coats of polyurethane recoatable finish applied at the manufacturer's plant with a dry film thickness of at least 40 microns each.

## 3. Miscellaneous

- a. Coatings for the interior surfaces shall be similar to the external surfaces except that a minimum total dry film thickness of 155 microns is required for these parts.
- b. Structures damaged during transportation, storage and erection shall be painted on site in accordance with the requirements described above.
- c. Non-ferrous metals, corrosion resisting steel, machined surfaces, and surfaces in sliding or friction contact shall not be painted.
- d. Machinery units, electrical equipment and panels, and other purchased components shall have the manufacturer's standard paint system and shall not be coated except as required to touch up paint damaged in

handling or assembly. Exterior components shall be given one finish coat to color coordinate with the final CT winch color scheme.

- e. Surfaces which do not require coating shall be protected during the coating of adjacent work. Machine-finished ferrous parts and surfaces, which do not require painting, shall be coated with a suitable rust preventative compound immediately after cleaning.
- f. Machined surfaces shall be coated with rust protection lacquer. For standard components e.g. motors, gear boxes etc. the manufacturer's standard coat shall be used.

### PART 3 EXECUTION

#### 3.01 PRELIMINARY AND FINAL FIELD TESTS

- A. All tests shall be in accordance with Section 01811 – Preliminary and Final Field Tests and as specified herein.
- B. CT winches shall be fully assembled at the manufacturer's facility prior to shipment. The manufacturer shall shop test one winch to demonstrate the capability of the winch, and compliance with this specification as follows:
  - 1. No load run thru at maximum speeds
  - 2. 100% Full load at full speed.
  - 3. 125% of rated load static test at zero speed.
- C. After installation, a site acceptance test shall be performed. Tests shall be performed in accordance with Paragraph 3.01 B above and as follows:
  - 1. CT winches shall be tested as a system with the guide sheaves and four roller fairleads. The test shall demonstrate that the system can safely handle the loads specified herein.
- D. When all defects and faults have been resolved and approved in writing, and it has been proven that the CT winches meet the specified performance requirements, and upon completion of training, the supplied winches shall be deemed to have been accepted.

-END OF SECTION-

**Section 14696**  
**MOORING CAPSTANS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section defines and includes the requirements for design, manufacture, installation and testing of electric mooring capstans for mooring and shifting barges. The mooring capstans shall be marine quality as outlined on the Contract Drawings and in this specification.
- B. The transfer station will require three (3) capstans. All capstans shall be furnished with electric motors and control equipment as specified in Paragraphs 2.03 A and B. All gearboxes and electrical controls shall be watertight. One (1) additional capstan shall be provided as a spare, for a total of four (4).
- C. The capstans shall be NABRICO Drawing DF-C-15-13-45-E or an approved equal as shown on the Contract Drawings and indicated by this specification.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 - Structural Steel
- B. Section 05500 - Metal Fabrications
- C. Section 05561 - Miscellaneous Metal Castings
- D. Division 16 - Electrical, various sections and as modified herein
- E. Section 17101 - SCADA System – General Requirements
- F. Section 17230 - SCADA System – HMI Software Requirements
- G. Section 17250 - SCADA System – Plantwide Network Equipment
- H. Section 17270 - SCADA System – Monitoring and Control Criteria
- I. Section 17280 - SCADA System – Input/Output Point List

**1.03 REFERENCES**

- A. Codes and Standards referred to in this section:
  - 1. AGMA - American Gear Manufacturers Association
  - 2. AISC - American Institute of Steel Construction
  - 3. ASME - American Society of Mechanical Engineers
  - 4. ASTM - American Society for Testing and Materials
  - 5. AWS - American Welding Society
  - 6. IEEE - Institute of Electrical and Electronics Engineers
  - 7. NEC - National Electric Code
  - 8. NEMA - National Electrical Manufacturers Association
  - 9. SSPC – Society for Protective Coatings
  - 10. OSHA - Occupational Safety and Health Administration

1.04 SUBMITTALS

- A. Furnish all submittals as specified in Section 01330 – Shop Drawings.

1.05 SPARE PARTS

- A. Spare parts for capstans at the transfer station shall be provided in accordance with Division 1 and as follows:
  - 1. One (1) complete capstan with submersible motor in accordance with Paragraph 2.03 A
  - 2. One (1) electric motor in accordance with Paragraph 2.03 A
  - 3. One (1) set of electrical controls in accordance with Paragraph 2.03 B
  - 4. One (1) complete brake assembly
  - 5. One (1) head (barrel) 15-inch diameter
  - 6. Three (3) sets of motor couplings

1.06 WARRANTY

- A. The Contractor shall guarantee the material and workmanship of the equipment installed under these specifications and make good any defects not due to ordinary wear or to improper use which may develop within one year after the completion of the installation or acceptance thereof by beneficial use, whichever is earlier.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide equipment of one of the following manufacturers or an approved equivalent in accordance with Section 01631 – Equivalent Materials and Equipment:
  - 1. Nashville Bridge Company. (Nabrico)  
Division of Trinity Industries, Inc.  
P.O. Box 239  
Nashville, TN 37202  
Tel.: +1 (615) 442-1300  
Fax: +1 (615) 442-1313  
<http://www.nabrico-marine.com>

2. Jered LLC  
103 Shipyard Drive  
P.O. Box 904  
Brunswick, GA 31521-0904  
Tel.: +1 (912) 262-2000  
Fax: +1 (912) 262-2051  
<http://www.jered.com>
3. Superior Lidgerwood-Mundy, Corp  
302 Grand Avenue  
P.O. Box 39  
Superior, WI 54880  
Tel.: +1 (715) 394-4444; +1 (888) 511-7922  
Fax: +1 (715) 394-6199  
Contact: Vicki Mc Cusker  
<http://www.lidgerwood.com>
4. Coastal Marine Equipment, Inc  
20995 Coastal Parkway Gulfport, MS 39503  
Tel: (228) 832-7655 Fax: (228) 832-7675  
Contact: Anthony Gauthier  
[anthonyg@coastalmarineequipment.com](mailto:anthonyg@coastalmarineequipment.com)

## 2.02 CAPSTAN SYSTEM AND COMPONENTS

- A. Brake motor shall be NEMA design "D", 30-minute duty, TENV, designed for wash down duty, with motor brakes. Motor shall have a removable weatherproof cover, and shall be painted the same as the capstan. The cover shall completely enclose the motor and terminal box and be fastened to the foundation by approved means.
- B. Combination starter control shall be included – circuit breaker type, full voltage, combination starter, in NEMA 4 enclosure, external reset, internal circuit breaker, coil and control circuit transformer and start/stop push button station located as required. Mushroom type lock-off panic button shall be installed at the base of the capstan head. All push-button station/lock-off panic buttons shall be weatherproof and dustproof type to meet the NEMA standard. The lock off panic button shall be engraved "Emergency Stop". Push buttons shall be Cutler-Hammer type or an approved equal.
- C. Typical Mooring Capstan Dimensions
  1. Width 31.5 inches
  2. Length 33.5 inches
  3. Height 40 inches
- D. Head Dimensions: 15 inches Diameter

## E. Performance

1. 15 HP motor with brake, 460 Volts, 3 ph, 60 Hz
2. 24,900 lbs. starting line pull
3. 12,450 lbs. running line pull
4. 45 FPM single speed
5. 50,000 lbs. static pull (bollard)

## 2.03 ELECTRICAL EQUIPMENT

## A. Electric Motor

1. 15 HP, 460 Volts, 3 ph, 60 Hz
2. Ambient: -20 to +120 Degrees F
3. Duty: 30-minute
4. Enclosure: Totally enclosed, non-ventilated (TENV), watertight. Motor shall be corrosion resistant when exposed to a salt-water environment.
5. Features: Automatic drain valve, 120 VAC space heater

## B. Electrical Control System

1. 15 HP, 460 Volts, 3 ph, 60 Hz
2. Ambient: -20 to +120 Degrees F
3. Duty: Continuous
4. Enclosure: NEMA 4X – Equipment shall operate outdoors in all weather conditions. Enclosure shall be corrosion resistant when exposed to a salt-water environment.
5. Equipment designed for indoor use shall be NEMA 12 enclosed, minimum.
6. Features: Motor Controller shall have 120 VAC space heater.

## C. Controls

1. Each capstan shall be operated locally.
2. Each capstan shall be designed to detect and relay malfunctions via the primary SCADA system to the Operations Room.

## 2.04 PAINTING

## A. Coating/Painting

1. The main structure of the capstans shall be painted gloss black with a three (3) part Zinc epoxy painting system as specified herein. The capstan heads shall be painted Safety Yellow with a three (3) part Zinc epoxy system as specified herein.
2. Difficult to spray areas, such as sharp plate edges, shall be power tool broken (chamfered or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
3. The paint system shall not crack or flake off within the guarantee period. The capstans shall be coated with durable finishes providing the required colors.

## B. Surface Preparation

1. Surfaces shall be thoroughly prepared in accordance with SSPC SP-10. Oil and grease shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.
2. Three types of coatings shall be used for the entire capstan surfaces. Coatings shall consist of a primer, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - a. Primer: One coat of Epoxy Zinc rich primer applied at the manufacturer's plant with a dry film thickness of at least 65 microns
  - b. Intermediate: One coat of Epoxy Micaceous iron oxide applied at the manufacturer's plant with a dry film thickness of at least 140 microns.
  - c. Finish: Two coats of polyurethane recoatable finish applied at the manufacturer's plant with a dry film thickness of at least 40 microns each

## C. Miscellaneous

1. Coatings for the interior surfaces shall be similar to the external surfaces except that a minimum total dry film thickness of 155 microns is required for these parts.
2. Structures damaged during transportation, storage and erection shall be painted on site in accordance with the requirements described above.
3. Non-ferrous metals, corrosion resisting steel, machined surfaces, and surfaces in sliding or friction contact shall not be painted.



4. Machinery units, electrical equipment and panels, and other purchased components shall have the manufacturer's standard paint system and shall not be coated except as required to touch up paint damaged in handling or assembly. Exterior components shall be given one finish coat to color coordinate with the final capstan color scheme.
5. Surfaces which do not require coating shall be protected during the coating of adjacent work. Machine-finished ferrous parts and surfaces, which do not require painting, shall be coated with a suitable rust preventative compound immediately after cleaning.
6. Machined surfaces shall be coated with rust protection lacquer. For standard components e.g. motors, gear boxes etc. the manufacturer's standard coat shall be used.

### PART 3 EXECUTION

#### 3.01 PRELIMINARY AND FINAL FIELD TESTS

- A. All tests shall be in accordance with Section 01811 - Preliminary and Final Field Tests and as specified herein.
- B. Capstans shall be fully assembled at the manufacturer's facility prior to shipment. One capstan shall be shop tested to demonstrate the capability of the design and compliance with this specification as follows:
  1. No-load run-through at maximum speeds
  2. 100% Full Load run-through at full speed
  3. 125% of the rated load static test at zero speed
- C. After installation, each capstan shall be field tested to demonstrate that it can moor or shift a barge to meet the intended design. Testing shall be in accordance with Section 01811 - Preliminary and Final Field Tests. .

-END OF SECTION-

**Section 14697**  
**MARINE CLEATS AND BOLLARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section defines the requirements for design, manufacture and testing of marine cleats and bollards for mooring and shifting barges. The cleats shall be marine quality as outlined in this specification.
- B. The transfer station will require a total of four (4) cleats and two (2) bollards. One (1) additional cleat and one (1) additional bollard shall be provided as spares, for a combined total of five (5) cleats and three (3) bollards.
- C. Each cleat shall be 42-inch cast steel Model CSC-3 as manufactured by MacElroy or approved equal as shown in the Contract Drawings and this specification.
- D. Each single horn bollard shall be cast steel Model CSB-4 as manufactured by MacElroy or approved equal as shown in the Contract Drawings and this specification.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05561 – Miscellaneous Metal Castings

**1.03 REFERENCES**

Codes and Standards referred to in this section are:

- A. ASTM – American Society for Testing and Materials
- B. SSPC – Society for Protective Coatings

**1.04 SUBMITTALS**

- A. Furnish all submittals as specified in Section 01330 – Shop Drawings.

**1.05 SPARE PARTS**

- A. A. Spare parts shall be in accordance with Division 1 and as follows:
  - 1. One (1) Cleat
  - 2. One (1) Bollard

## 1.06 WARRANTY

- A. The Contractor shall guarantee the material and workmanship of the equipment installed under these specifications and make good any defects not due to ordinary wear or to improper use which may develop within one year after the completion of the installation or acceptance thereof by beneficial use, whichever is earlier.

## PART 2 PRODUCTS

## 2.01 ACCEPTABLE VENDORS

- A. Subject to compliance with requirements, provide equipment of one of the following vendors or an approved equivalent in accordance with Section 01631 - Equivalent Materials and Equipment:

1. J. C. MacElroy Company., Inc.  
91 Ethel Road W.  
P.O. Box 850  
Piscataway, NJ 08855  
Tel.: +1 (732) 572-7100; +1 (800) 622-3576  
<http://www.macelroy.com>
2. Anchor Marine and Industrial Supply, Inc.  
6545 Lindbergh  
Houston, TX 77258  
Tel.: +1 (713) 644-1183; +1 (800) 233-8014  
Fax: +1 (713) 644-1185  
<http://www.anchormarinehouston.com>
3. Nabrico Products, Division of Trinity Industries, Inc.  
P.O. Box 239  
Nashville, TN 37202  
Tel.: +1 (713) 644-1183; +1 (800) 233-801 Tel.: +1 (615) 442-1300  
Fax: +1 (615) 442-1313  
<http://www.nabrico-marine.com>

## 2.02 REQUIREMENTS

- A. Each cleat and bollard shall be designed and manufactured in accordance with the Contract Drawings and as follows.
- B. Cleat
1. Material – cast steel conforming to ASTM-A-27, Gr 65-35.

2. Cleat shall be designed for 25 short ton Safe Working Load at 30-degree angle of pull as shown on the Contract Drawings, with a factor of safety of 3 based on the Safe Working Load.
3. Cleats shall be furnished with mounting holes required to anchor each unit to the pier as shown on the Contract Drawings.

C. Bollard

1. Maximum safe working load of 52 short tons under the horn horizontally, with a factor of safety of 3 based on the Safe Working Load.
2. Material – cast steel – ASTM-A-27 Gr 65-35.
3. Bollards shall be furnished with mounting holes for anchoring to the pier as shown on the Drawings.
4. Core shall be filled with concrete prior to delivery.

2.03 PAINTING

A. Coating/Painting

1. The cleats and bollards shall be painted with a three (3) part Zinc epoxy painting system as specified herein. Cleats and bollards shall be painted Safety Yellow.
2. Difficult to spray areas, such as sharp edges, shall be power tool broken (chamfered or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
3. The paint system shall not crack or flake off within the guarantee period. Cleats and bollards shall be coated with durable finishes providing the required colors.

B. Surface Preparation

1. Surfaces shall be thoroughly prepared in accordance with SSPC-SP 10. Oil and grease shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.

2. Three types of coatings shall be used for the entire surfaces of cleats and bollards. Coatings shall consist of a primer, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - a. Primer: One coat of Epoxy Zinc rich primer applied at the manufacturer's plant with a dry film thickness of at least 65 microns
  - b. Intermediate: One coat of Epoxy Micaceous iron oxide applied at the manufacturer's plant with a dry film thickness of at least 140 microns.
  - c. Finish: Two coats of polyurethane recoatable finish applied at the manufacturer's plant with a dry film thickness of at least 40 microns each.
- C. Fittings damaged during transportation, storage or installation shall be painted on site in accordance with the requirements described above.

### PART 3 EXECUTION

#### 3.01 TESTS

- A. The manufacturer shall shop test one (1) cleat and one (1) bollard at its facility to demonstrate that they meet the requirements of its design. The manufacturer shall provide test a certificate for each test conducted.

-END OF SECTION-

**Section 14698**  
**MARINE FAIRLEAD SHEAVES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section defines the requirements for design, manufacture, and testing of marine fairlead guide sheave assemblies for mooring barges. The sheave assemblies shall be used to fairlead 1-inch diameter wire rope between the constant tension (CT) winch and the marine roller fairlead assembly at each end of the pier. The sheave assemblies shall be marine quality as outlined in this specification.
- B. The transfer station will require two (2) sheave assemblies. One (1) additional sheave assemblies shall be provided as a spare, for a combined total of three (3).
- C. Each sheave assembly shall be in accordance with Smith-Berger, Model No. MC-1214-BD or approved equal as shown on the Contract Drawings, and within this specification.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05500 – Metal Fabrications
- B. Section 05561 – Miscellaneous Metal Castings
- C. Section 05120 – Structural Steel

**1.03 REFERENCES**

- A. Codes and Standards referred to in this section are:
  - 1. AISC – American Institute of Steel Construction
  - 2. ASTM – American Society for Testing and Materials
  - 3. AWS – American Welding Society
  - 4. SAE – Society of Automotive Engineers
  - 5. SSPC – Society for Protective Coatings

**1.04 SUBMITTALS**

- A. Furnish all submittals as specified in Section 01330 – Shop Drawings.

**1.05 SPARE PARTS**

- A. Spare parts shall be in accordance with Division 1 and as follows:
  - 1. One (1) complete sheave assembly
  - 2. One (1) sheave

3. One (1) alloy steel shaft
4. Two (2) grease impregnated bronze bearings

## 1.06 WARRANTY

- A. The Contractor shall guarantee the material and workmanship of the equipment installed under these specifications and make good any defects not due to ordinary wear or to improper use which may develop within one year after the completion of the installation or acceptance thereof by beneficial use, whichever is earlier.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide equipment of one of the following manufacturers or an approved equivalent in accordance with Section 01631 - Equivalent Materials and Equipment:

1. Smith -Berger Marine, Inc.  
7915 10th Avenue South  
Seattle, WA 98108  
Tel.: (206) 764-4650  
Fax: (206) 764-4653  
<http://www.smithberger.com>
2. The Crosby Group, Inc.  
2801 Dawson Road  
Tulsa, OK 74110  
Tel.: +1 (918) 834-4611  
Fax: +1 (918) 832-8833  
Sales Representative Contact, New York area:  
Brett Woodland +1 (860) 428-2708  
<http://www.thecrosbygroup.com>
3. Skookum, Inc.  
6160 S. Whiskey Hill Road  
Hubbard, OR 97032  
Tel.: +1 (503) 651-3175  
Fax: +1 (503) 651-3409  
Contact: [skookum@ulvencompanies.com](mailto:skookum@ulvencompanies.com)  
<http://www.thomasregister.com/olc/skookum>

### 2.02 REQUIREMENTS

- A. Each guide sheave assembly shall be designed and fabricated as shown on the Drawings and in accordance with this specification.

- B. Minimum design temperature of - 20 degrees Fahrenheit for above water operation.
- C. The sheave mounting base shall be manufactured from steel plate ASTM A572 and provided with bolt holes in the base for mounting to a sub-base as shown on the Drawings.
- D. The guide sheave shall be furnished with a 14 inch outside diameter, 11-7/16 inch tread diameter, cast steel, SAE 1040/1045. Sheaves shall be grooved for one inch (1") diameter wire rope. All sheave surfaces shall be finished such that they are free from burrs, sharp edges and other surface imperfections. The wire rope groove shall be flame hardened to 40 Rockwell C scale.
- E. The sheaves shall have grease impregnated bronze bearings designed to rotate on steel shafts.

## 2.03 PAINTING

- A. Guide sheaves shall be coated as follows:

### 1. Coating/Painting

- a. The guide sheaves shall be painted with a three (3) part Zinc epoxy painting system as specified herein. Sheaves shall be painted Safety Yellow.
- b. Difficult to spray areas, such as sharp plate edges, shall be power tool broken (chamfered or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
- c. The paint system shall not crack or flake off within the guarantee period. Sheaves shall be coated with durable finishes providing the required colors.

### 2. Surface Preparation

- a. Surfaces shall be thoroughly prepared in accordance with SSPC-SP 10. Oil and grease shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.



- b. Three types of coatings shall be used for the entire guide sheave surfaces. Coatings shall consist of a primer, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - (1) Primer: One coat of Epoxy Zinc rich primer applied at the manufacturer's plant with a dry film thickness of at least 65 microns
  - (2) Intermediate: One coat of Epoxy Micaceous iron oxide applied at the manufacturer's plant with a dry film thickness of at least 140 microns.
  - (3) Finish: Two coats of polyurethane recoatable finish applied at the manufacturer's plant with a dry film thickness of at least 40 microns each.
- B. Fittings damaged during transportation, storage or installation shall be painted on site in accordance with the requirements described above.

### PART 3 EXECUTION

#### 3.01 FIELD TESTS

- A. All tests shall be in accordance with Section 01811 - Preliminary and Final Field Tests and as follows:
  - 1. The fairlead sheaves shall be tested in conjunction with testing of the constant tension winches and roller fairleads.

-END OF SECTION-

**Section 14699**  
**MARINE FOUR ROLLER FAIRLEADS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section defines the requirements for design, manufacture, and testing of marine four roller fairlead for mooring barges. The four roller fairlead shall be marine quality as outlined in this specification. The four roller fairlead will be used to lead 1-inch diameter wire rope from the constant tension winch and sheave assembly to barges.
- B. The transfer station will require two (2) four roller fairleads each. One (1) additional four roller fairlead shall be provided as a spare, for a combined total of three (3) fairleads.
- C. Each four roller fairlead assembly shall be in accordance with Smith-Berger model No. FR4-8-BD or approved equal as shown on the Contract Drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 05120 – Structural Steel
- B. Section 05500 – Metal Fabrications

**1.03 REFERENCES**

- A. Codes and Standards referred to in this section are:
  - 1. AISC – American Institute of Steel Construction
  - 2. ASTM – American Society for Testing and Materials
  - 3. AWS – American Welding Society
  - 4. SSPC – Society for Protective Coatings

**1.04 SUBMITTALS**

- A. Furnish all submittals as specified in Section 01330 – Shop Drawings.

**1.05 SPARE PARTS**

- A. Spare parts shall be in accordance with Division 1 and as follows:
  - 1. One (1) complete four roller fairlead assembly
  - 2. Two (2) rollers
  - 3. Two (2) roller shafts
  - 4. Four (4) grease impregnated bronze bearings

1.06 WARRANTY

- A. The Contractor shall guarantee the material and workmanship of the equipment installed under these specifications and make good any defects not due to ordinary wear or to improper use which may develop within one year after the completion of the installation or acceptance thereof by beneficial use, whichever is earlier.

PART 2 PRODUCTS

2.01 ACCEPTABLE VENDORS

- A. Subject to compliance with requirements, provide equipment of one of the following vendors or an approved equivalent in accordance with Section 01631 - Equivalent Materials and Equipment:

1. Smith –Berger Marine, Inc.  
7915 10th Avenue South  
Seattle, WA 98108  
Tel.: (206) 764-4650  
Fax: (206) 764-4653  
<http://www.smithberger.com>
2. Anchor Marine and Industrial Supply  
P.O. Box 58645  
6545 Lindbergh  
Houston, TX 77258  
Tel.: (713) 644-1183; (800) 233-8014  
Fax: (713) 644-1185  
Contact: [Gabriel@anchormarinehouston.com](mailto:Gabriel@anchormarinehouston.com)  
<http://www.anchormarinehouston.com>
3. Nabrico Products, Division of Trinity Industries, Inc.  
P.O. Box 239  
Nashville, TN 37202  
Tel.: (615) 442-1300  
Fax: (615) 442-1313  
<http://www.nabrico-marine.com>

2.02 REQUIREMENTS

- A. Each four-roller fairlead shall be designed in accordance with the drawing and as follows:
  1. Minimum design temperature of -20 degrees Fahrenheit for above water operation.

2. The fairlead shall be furnished with four (4) 8-inch diameter rollers manufactured from hardened alloy steel tubing having a minimum surface hardness of 40 Rockwell C scale. The rollers shall be positioned to provide an 8-inch square opening.
3. The mounting base and frame of the roller fairlead shall be fabricated from steel plate ASTM A572 with holes in the base plate as shown on the Drawing.
4. The rollers shall have grease impregnated bronze bearings designed to rotate on steel shafts.

## 2.03 PAINTING

### A. Coating/Painting

1. The roller fairleads shall be painted with a three (3) part Zinc epoxy painting system as specified herein. Roller fairleads shall be painted Safety Yellow.
2. Difficult to spray areas, such as sharp plate edges, shall be power tool broken (chamfered or rounded) and stripe coated before spray application, in order to obtain an even film thickness on all places.
3. The paint system shall not crack or flake off within the guarantee period. Roller fairleads shall be coated with durable finishes providing the required colors.

### B. Surface Preparation

1. Surfaces shall be thoroughly prepared in accordance with SSPC-SP 10. Oil and grease shall be removed by suitable solvents. No coating shall be applied unless the surface has been cleaned and is dry and free from rust, loose mill scale, dirt, oil, grease and other foreign substances.
2. Three types of coatings shall be used for the entire roller fairlead surfaces. Coatings shall consist of a primer, an intermediate coat and finish coats, with at least 285 microns total dry film thickness as follows:
  - a. Primer: One coat of Epoxy Zinc rich primer applied at the manufacturer's plant with a dry film thickness of at least 65 microns.
  - b. Intermediate: One coat of Epoxy Micaceous iron oxide applied at the manufacturer's plant with a dry film thickness of at least 140 microns.
  - c. Finish: Two coats of polyurethane recoatable finish applied at the manufacturer's plant with a dry film thickness of at least 40 microns each.

- C. Fittings damaged during transportation, storage or installation shall be painted on site in accordance with the requirements described above.

### PART 3 EXECUTION

#### 3.01 PRELIMINARY AND FINAL FIELD TESTS

- A. All tests shall be in accordance with Section 01811 - Preliminary and Final Field Tests and as follows:
  - 1. The marine four roller fairleads shall be tested in conjunction with the testing of the constant tension winches and fairlead sheaves.

-END OF SECTION-

**Section 15050**  
**BASIC MECHANICAL MATERIALS AND METHODS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems
  2. Transition fittings
  3. Dielectric fittings
  4. Mechanical sleeve seals
  5. Sleeves
  6. Escutcheons
  7. Grout
  8. Equipment installation requirements common to equipment sections
  9. Painting and finishing
  10. Concrete bases
  11. Supports and anchorages

**1.02 RELATED SPECIFICATIONS**

- A. Section 15076 - Piping And Equipment Identifications  
B. Section 15771 - Electric Heat Tracing Systems

**1.03 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, and crawlspaces.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

## 1.04 SUBMITTALS

## A. Product Data: For the following:

1. Transition fittings
2. Dielectric fittings
3. Mechanical sleeve seals
4. Escutcheons

## B. Welding certificates

## 1.05 QUALITY ASSURANCE

## A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel"

## B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications"

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping"
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

## 1.06 DELIVERY, STORAGE, AND HANDLING

## A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

## 1.07 COORDINATION

## A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

## B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

## C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## PART 2 PRODUCTS

## 2.01 PIPE, TUBE, AND FITTINGS

## A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.02 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

## 2.03 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries
    - e. Smith-Blair, Inc.
    - f. Viking Johnson
    - g. Or approved equal



2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling
4. Aboveground Pressure Piping: Pipe fitting

#### 2.04 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers

- a. Capitol Manufacturing Co.
- b. Central Plastics Company
- c. Eclipse, Inc.
- d. Epco Sales, Inc.
- e. Hart Industries, International, Inc.
- f. Watts Industries, Inc.; Water Products Div.
- g. Zurn Industries, Inc.; Wilkins Div.
- h. Or approved equal

- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 psig minimum working pressure as required to suit system pressures.

1. Manufacturers

- a. Capitol Manufacturing Co.
- b. Central Plastics Company
- c. Epco Sales, Inc.
- d. Watts Industries, Inc.; Water Products Div.
- e. Or approved equal

- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers

- a. Advance Products & Systems, Inc.
- b. Calpico, Inc.
- c. Central Plastics Company
- d. Pipeline Seal and Insulator, Inc.
- e. Or approved equal

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

- F. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers

- a. Calpico, Inc.
- b. Lochinvar Corp.
- c. Or approved equal

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers

- a. Perfection Corp.
- b. Precision Plumbing Products, Inc.
- c. Sioux Chief Manufacturing Co., Inc.
- d. Victaulic Co. of America
- e. Or approved equal

## 2.05 MECHANICAL SLEEVE SEALS

- A. Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers

- a. Advance Products & Systems, Inc.
- b. Calpico, Inc.
- c. Or approved equal

## 2.06 SLEEVES FOR PIPES

- A. Sleeves and materials for sealing sleeves for gas piping through exterior walls and floor slabs on earth shall be as specified and approved by the Gas Company.
- B. Sheet metal sleeves shall be 20 gauge.
- C. Pipe sleeves shall be service weight cast iron pipe or schedule 40 galvanized steel pipe.
- D. Fire stop penetration materials for sealing sleeves shall be listed by Underwriters Laboratories and shall have Material and Equipment Acceptance (MEA) approval. The materials shall be as specified in Section 07842 - Fire-Resistive Joint Materials.
- E. Material for sealing spaces between pipe and sleeve through all walls below and above grade shall be Roxtec Sealing System as manufactured by; Roxtec International. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. Links shall be loosely assembled with bolts to form a continuous rubber bolt around the pipe with a pressure plate under each bolt head and nut.
- F. Materials for sealing space between each pipe and sleeve through non-fire rated exterior walls above grade shall be Non-shrinking cement
- G. Waterproof sleeves shall be Roxtec Sealing System as manufactured by Roxtec International or approved equal.

## 2.07 ESCUTCHEONS PLATES

- A. Galvanized cast-iron with set screw as manufactured by Grinnell, Fig. No. 395 or Carpenter & Paterson, Inc. Submit manufacturer product technical data.
- B. Galvanized cast iron escutcheons with set screw shall be chrome plated for use in finished rooms or spaces.
- C. Chrome plated cast brass with brass set screws as manufactured by Kohler or McGuire Mfg. Co., Catalog No. 127. Submit manufacturer product technical data.

## 2.08 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

### 3. Packaging: Premixed and factory packaged

## PART 3 EXECUTION

### 3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Sleeves for Pipes
  - 1. General: All plumbing pipes passing through floors, roofs, walls, partitions, furring, beams, trenches, and wherever else indicated on drawings shall be provided with sleeves installed and maintained by the Contractor. Core drilled holes shall be provided with sleeves. Where plumbing pipes pass through potentially wet floors that do not have membrane waterproofing such as toilet rooms, janitor's sink closet, mechanical equipment rooms, pipe chases and areas that are provided with fire protection sprinkler systems, the

Contractor shall install sleeves of galvanized steel pipe with welded clips or equivalent at bottom ends for securing sleeves to form work and shall project one inch above finished floors, and shall be caulked watertight.

2. Sleeves for gas service piping through exterior walls below grade and floor slabs on earth shall be installed and sealed in accordance with the latest regulations of the Administrative Code of the City of New York. Sleeves for gas piping and gas vents through exterior walls shall be installed and sealed in accordance with the requirements of the serving utility. The space between each pipe and its sleeve through floor slabs on earth and exterior walls above grade for all other piping shall be sealed tightly with picked oakum and molten lead. The lead caulking shall finish flush with the face of the sleeve. The space between each pipe and its sleeve through exterior walls below grade for all other piping shall be sealed tightly with link seals.
3. For interior walls and floors and for pipes through roof, the space between each installed pipe and its sleeve shall be sealed with a three hour rated fire stop penetration material. Fire stop materials shall be installed in accordance with the instructions of the manufacturer.
4. Sheet Metal Sleeves
  - a. Sleeves for pipes passing through floors, partitions, hung or furred ceilings shall be installed with 1/2" maximum clearance all around pipes. Each sleeve for a pipe passing through an interior floor slab shall be fitted with a one-inch flange, or equivalent, at the bottom end for the purpose of securing it to the form work or sheet metal deck. The sleeve shall finish flush with the top of the finished floor. Sleeves for pipes passing through partitions, hung or furred ceilings shall be of one piece construction and shall finish flush with the finished surface.
  - b. Sleeves installed for pipes passing through vent ducts shall be securely fastened, soldered and made airtight.
5. Pipe Sleeve: Install pipe sleeves for pipes passing through roofs, concrete beams, brick walls, foundation walls and floor slabs on earth. Sleeves shall be installed with 1/2" maximum clearance all around pipe and shall finish flush with the surfaces penetrated. Pipe sleeves for pipes through roof shall be made of service weight cast iron only.
6. Sleeves through foundation walls below grade shall be provided under General Construction Work.

## M. Escutcheon Plates

1. Install chrome plated solid cast iron escutcheon plates with set screw on exposed pipes passing through walls, partitions, floors and ceilings, in finished rooms and spaces.
2. Install galvanized solid cast iron escutcheon plates with set screw on concealed pipes passing through walls, partitions, floors and on exposed piping in unfinished rooms and spaces.
3. Install chromium plated cast brass escutcheon plates with brass set screw on waste and water supply piping at all plumbing fixtures including lavatories, drinking fountains, cabinet sinks, wash sinks, etc.
4. Plates shall fit snugly around the pipes and shall be fastened in place before pipes are insulated or concealed.
5. Split type escutcheon plates are not acceptable. Retain paragraph above or below.

## N. Verify final equipment locations for roughing-in.

## 3.02 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. **Damaged Threads:** Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. **Welded Joints:** Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. **Flanged Joints:** Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.03 PIPING CONNECTIONS

- A. **Make connections according to the following, unless otherwise indicated:**
  1. **Install unions,** in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. **Install flanges,** in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. **Dry Piping Systems:** Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. **Wet Piping Systems:** Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. **Install equipment** to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. **Install equipment level and plumb,** parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. **Install mechanical equipment** to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. **Install equipment** to allow right of way for piping installed at required slope.

### 3.05 PAINTING

- A. **Painting of mechanical systems, equipment, and components** is specified in Section 09912 - Interior Painting and Section 09911 - Exterior Painting.

- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions, according to seismic codes at Project, and as described in Section 01732 – Installation of Equipment.

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section 05500 - Metal Fabrications for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.08 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 15051**  
**DUCTILE IRON PIPE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing ductile iron pipe, fittings and specials.
- B. Ductile iron pipe and fittings shall be furnished and installed complete with all necessary jointing materials, wall castings, wall sleeves, specials, couplings, hangers, supports, anchors, adapters, identification signs, and other appurtenances as shown on the Contract Drawings and as required for a complete installation.
- C. The Contractor shall provide all labor and materials for making connections to existing lines or lines installed under other contracts, including all specials required to connect pipe of dissimilar materials.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02503 - Installation of Buried Pipelines
- B. Section 02505 - Leakage Tests
- C. Section 03300 - Cast-in-Place Concrete
- D. Section 07845 - Annular Space Seals
- E. Section 09911 - Interior Painting
- F. Section 15056 - Pipe Couplings
- G. Section 15060 - Hangers and Supports
- H. Section 15076 - Piping and Equipment Identification.
- I. Section 15081 - Piping Insulation
- J. Section 15120 - Interior and Exposed Piping Schedule
- K. Section 15141 - Disinfection

**1.03 REFERENCES**

- A. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems
- C. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids
- D. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- E. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

- F. AWWA C150 - Thickness Design of Ductile Iron Pipe
- G. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water
- H. AWWA C153 - Ductile-Iron Compact Fittings, 3 inches through 24 inches and 54 through 64 inches, for Water Service
- I. AWWA C606 - Grooved and Shouldered Joints
- J. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners
- K. ASTM B98 - Copper Silicon Alloy Rod, Bar and Shapes
- L. ASTM C283 - Resistance of Porcelain Enameled Utensils to Boiling Acid
- M. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
- N. DIPRA - Handbook of Ductile Iron Pipe
- O. NY Spec 24-C-38 - Caulking
- P. New York City Building Code
- Q. New York Department of Environmental Protection (NYCDEP) Bureau of Water Supply Standard Water Main Specifications

#### 1.04 DESIGN AND MANUFACTURING REQUIREMENTS

- A. Ductile iron pipe shall conform to the American National Standards Institute (ANSI) and American Water Works Association (AWWA) Standards specified herein and recommendations as given in the Ductile Iron Pipe Research Association (DIPRA) "Handbook of Ductile Iron Pipe." Ductile iron pipe for City of New York water shall conform to the rules and regulations of the New York City Building Code and the NYCDEP Bureau of Water Supply; requirements contrary to such rules and regulations specified herein shall be disregarded.

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with Section 01330 - Shop Drawings.
- B. Obtain from the piping manufacturer and submit the following data:
  - 1. Shop Drawings
  - 2. Results of Certified Shop Tests
  - 3. Certified Letters of Compliance

C. Shop Drawings shall include, but not be limited to:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various piping components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
2. Complete layout and installation drawings, including plans, sections and cross-sections showing elevations with clearly marked dimensions. Piece numbers, which are coordinated with the tabulated pipe layout schedule, shall be clearly marked. Scale and size of the drawings shall conform to the General Conditions and Division 1. Piping layout drawings shall indicate information on pipe supports, location, support type, hanger rod size, insert type and the load in pounds.
3. Details of pipe lining, coating, wrapping, insulation and painting of all pipe.
4. Weights of all component parts.
5. Tabulated pipe layout schedule shall include the following information for all pipe and fittings: service, pipe size, working pressure, joint type, wall thickness, piece number and laying length.
6. Flexible couplings, with harness details if required.
7. Locations where pipe and valve identification signs will be placed.

1.06 QUALITY ASSURANCE

- A. The pipe and fittings covered by these specifications shall be provided by the Contractor through qualified manufacturers experienced in the fabrication, castings and manufacture of the pipe materials specified herein. The pipe and fittings shall be designed, fabricated and installed in accordance with standards specified herein.

1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Special care in handling shall be exercised during delivery, storage and handling of pipe to avoid damage and setting up stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.
- C. No material furnished under this specification shall be shipped to the job site until all submittals have been approved.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

## A. Acceptable manufacturers are listed below.

1. Ductile-iron pipe and fittings
  - a. American Cast Iron Pipe Company
  - b. McWane Incorporated
  - c. United States Pipe and Foundry Company
  - d. Griffin Pipe Products, Incorporated
  - e. Or approved equal
2. Ductile-iron retainer glands
  - a. 3-inch through 24-inch diameter
    - (1) Nappco, Inc. Series 1246
    - (2) Ebba Iron, Inc., Series 100
    - (3) Or approved equal
  - b. larger than 24-inch diameter
    - (1) Ebba Iron, Inc., Megalug
    - (2) Or approved equal
3. Sleeve-type couplings
  - a. 12-inches in diameter and smaller
    - (1) Dresser Industries, Style 153
    - (2) Smith-Blair, Type 441 Omni Coupling System
    - (3) Or approved equal
  - b. larger than 12-inches in diameter
    - (1) Dresser Industries, Style 38
    - (2) Smith-Blair, Type 411
    - (3) Or approved equal
  - c. Gaskets
    - (1) Dresser Plain Grade 27
    - (2) Smith-Blair 003
    - (3) Or approved equal

## 4. Restrained Push-On Joints

- a. United States Pipe and Foundry, TR Flex
- b. McWane Incorporated, Super-Lock
- c. American Cast Iron Pipe Company, Lok-Ring or Flex-Ring
- d. Griffin Pipe Products, Incorporated, Snap-Lok
- e. Or approved equal

## 5. Gaskets

- a. John Crane, Inc.
- b. Garlock Packing Company
- c. U.S. Rubber Company
- d. American Cast Iron Pipe Company
- e. United States Pipe and Foundry Company
- f. McWane Incorporated
- g. Or approved equal

## 6. Coatings and Linings

- a. Kop-coat
- b. Tnemec
- c. American Cast Iron Pipe Company
- d. United States Pipe and Foundry Company
- e. Or approved equal

## 2.02 MATERIALS

## A. General

- 1. Pipe shall be in accordance with AWWA C151 for push-on, restrained joint, or mechanical joint pipe and AWWA C115 for flanged pipe and shall be of grade 60-42-10 ductile iron. The above standards cover ductile iron pipe with nominal pipe sizes from three (3) inches up to and including sixty-four (64) inches in diameter. Pipe thickness shall be designed in accordance with AWWA C150.
- 2. Provide pipe of the various sizes and classes as specified in the pipe schedules or shown on the Contract Drawings. See Section 02503- Installation of Buried Pipelines and Section 15120 - Interior and Exposed Piping Schedule for pipe schedules. Provide minimum Thickness Class 53 for pipe with threaded flanges.

## B. Buried Water Service Pipe

- 1. In accordance with NYCDEP standards, all pipe for buried water service, including flanged pipe, for sizes up to and including twelve (12) inches shall

have a wall thickness equal to Special Thickness Class 56 as specified in AWWA C151.

2. In accordance with NYCDEP standards, all pipe for buried water service, including flanged pipe, for sizes over twelve (12) inches and up to fifty-four (54) inches shall have a wall thickness equal to Special Thickness Class 54 as specified in AWWA C151. Sizes sixty (60) and sixty-four (64) inches shall have a wall thickness equal to pressure class 350.

#### C. Fittings

1. Fittings shall be ductile iron and shall be in accordance with AWWA C110. Any other fittings, not included in AWWA C110, shall conform in design and performance to the requirements of this Standard.
2. Blind, filler, companion and reducing flanges shall conform to ANSI/ASME B16.1.
3. Where compact fittings are shown or indicated, items shall be in accordance with AWWA C153.

#### D. Flanged Joints

1. Threaded Flanges: Shall be solid, threaded, ductile-iron, flanges meeting the requirements of AWWA C115. Threaded flanges and pipe shall be assembled and faced by the pipe manufacturer; field or shop assembly will not be accepted. Threaded flanges shall be screwed on tight without overstressing the threads and, when properly assembled, shall be concentric with the pipe.
2. The dimensions of all flanges for pipe fittings and specials and the number and sizes of bolts, up to and including 54 inches, shall be in accordance with ANSI B16.1, Class 125 standard flanges.
3. For pipe larger than 54 inches, flanged pipe shall have ANSI Class 125 flanges integrally cast solid and at right angles to the pipe axis, and accurately faced and drilled smooth and true. Flange bolt holes shall be backfaced or spot-faced as required by ANSI specifications.
4. Flanges shall be tapped where tap or stud bolts are required.
5. Bolts: Bolts shall be in accordance with Appendix A of AWWA C115 and as follows: Flanged joints shall be made with bolts or stud-bolts with a nut on each end. Bolts, stud-bolts and nuts shall be ANSI heavy dimension, semi-finish, with square heads and cold-punched hexagonal nuts. For bolts 1-3/4 inches in diameter and larger, stud-bolts shall be used. Bolt size shall be American Standard for ANSI Class 125 flanges. Where flanged joints are in manholes or submerged in tanks, bolts, stud-bolts, and nuts shall be silicon

bronze, ASTM B98, Alloy A, of dimensions and sizes equal to steel bolts, stud-bolts, and nuts specified in Appendix A of AWWA C115.

6. Gaskets: Flange gaskets shall be in accordance with Appendix A of AWWA C115. They shall be full-face gaskets for flanged joints on 12-inch diameter and smaller pipe and shall be of the ring type for flanged joints on larger pipe.
7. After each flanged joint has been made, all bolt heads and nuts, and all surfaces of the flanges not to be painted shall be given two coats of asphaltic coating meeting the requirements of AWWA C151.

E. Grooved-Type Joints

1. Shall be in accordance with AWWA C606 and Section 15056 - Pipe Couplings.

F. Mechanical and Push-On Type Joints

1. Shall be in accordance with AWWA C111.
2. Restrained push-on joints for water lines shall comply with NYCDEP Bureau of Water Supply Standard Water Main Specifications.

G. Flanged Adaptors

1. Bolt hole and bolt patterns shall conform to the mating flange patterns as specified in the piping paragraphs. Bolts, nuts, and flange gaskets shall conform to the specifications for the adjacent piping.
2. Shall have ductile iron bodies.
3. Shall be Models 912 as manufactured by Rockwell Industries or equivalent models by Dresser, Clow, or approved equal.
4. Shall have a rated working pressure of 175 psig.
5. Pipe shall be anchored by using anchor studs drilled into the coupling and connected pipe for nominal pipe size twelve (12) inches and smaller. For nominal pipe sizes over twelve (12) inches, pipe shall be restrained by harnesses or pipe supports as specified for sleeve type couplings.

H. Harnesses

1. Where shown, specified or required, harnesses for pipe with mechanical joints shall be provided.



2. For ductile-iron pipe and fittings with mechanical joints that require harnessing, restrained type mechanical joint pipe will be considered as an alternate upon submission to the Commissioner for approval.
3. Joint Assemblies: Joint assemblies shall be designed to resist pullout of the joints at the test pressures specified for the piping system.

I. Sleeves

1. Sleeves shall be in accordance with AWWA C110. They shall be of ductile iron and shall be provided at all points where pipes will pass through walls and floors and where wall or floor castings are not provided. Unless otherwise shown, sleeves shall have intermediate collars not less than 1/2-inch thick and 1-1/2 to 2 inches high located at the center of the wall.
2. For exterior walls of structures, wall sleeves shall be plain ends and of flush wall design.
3. Where shown on the Contract Drawings or required to maintain 2 hour fire rating, modular wall seals shall be installed in the annular space between the pipe and the sleeve. Wall seals shall be in accordance with Section 07845 - Annular Space Seals. In all other locations, caulk shall be installed in the annular space between the pipe and the sleeve. Caulking materials shall be in accordance with N.Y. Spec 24-C-38. For flanged pipe, sleeves shall be fabricated large enough to accommodate flanges.

J. Sleeve-Type Couplings

1. Sleeve-type couplings shall be in accordance with Section 15056 - Pipe Couplings.
2. Pipe and fittings for use with sleeve-type flexible couplings shall be plain end.

K. Wall Castings, Connecting Pieces, and Special Fittings

1. Wall castings and connecting pieces shall be in accordance with AWWA C110, 250 psi pressure rating, unless specified otherwise. Concrete encased wall castings connected to sluice gates and valves shall be cast from alloy iron, Ni-Resist Type 1, International Nickel Co. or approved equal. Wall castings and connecting pieces shall be furnished with ANSI Class 125 flanged ends, bell ends, flare ends and/or spigot ends where shown, specified or required.
2. Wall castings shall be of standard wall pipe dimensions, unless piping layout precludes their use, in which case special castings shall be furnished.

3. Design of Specials: Special fittings where required shall be of an approved design that meet the same specifications and have the same diameters and thicknesses as standard fittings. Any tees, crosses, elbows, laterals, reducers or other fittings of current ANSI or AWWA standard dimensions are not considered specials.
4. Intermediate Collar: Wall castings shall have an integrally cast intermediate collar not less than 1/2-inch thick and 1-1/2 to 2-inches high located at the center of the wall unless otherwise shown.
5. Where space limitations prevent the use of through bolts for assembling flange connections, stud bolts shall be provided on wall casting flanges.

L. Cleanouts

1. Cleanouts shall be furnished and installed where shown or specified.
2. Size: Cleanout openings shall be not less than 6 inch diameter for pipe 8 inches in diameter or larger. For pipe 6 inches in diameter or smaller, they shall be of the same diameter as the pipe.
3. Cleanout Covers: Cleanout covers which are blind flanges shall be in accordance with AWWA C110, except where conformation is required with the inside curvature of the pipe, in which case the covers shall be flanged plugs of proper shape with American Standard flange drilling.
4. Covers shall be fastened by means of steel studs and bronze nuts and shall be drilled and tapped for a 1-1/2-inch diameter pipe connection.
5. Flange plugs shall be equipped with a dowel or other suitable means to provide proper setting.

M. Coatings and Linings

1. Cement Lining: All ductile-iron pipe and fittings shall be furnished with a cement-mortar lining not less than twice the standard thickness and seal coating meeting the requirements of AWWA C104.
2. Exterior Primer: Pipe and fittings shall be shop coated on the outside in accordance with Section 09912 – Interior Painting or Section 09911 – Exterior Painting for use in exposed locations, such as inside buildings or exterior locations where finish painting or insulating is required.
3. Painting: Pipe and fittings shall be painted in accordance with Section 09912 - Interior Painting or Section 09911 - Exterior Painting.

4. Asphaltic Coating: Pipe and fittings that will not be exposed to view shall be coated with the standard asphaltic outside coating specified in AWWA C151, at twice the specified thickness. Unlined pipe shall be coated with the standard asphaltic inside coating specified in AWWA C151.
5. Epoxy and Urethane Coatings: Epoxy and urethane coatings shall be applied in accordance with Section 09912 - Interior Painting.
6. Polyethylene Encasement: Where ductile iron pipe is in contact with soils, the pipe shall be encased in polyethylene film in accordance with AWWA C105 to isolate the pipe surface from contact with the soils.
7. Concrete Encased Pipe: Pipe and fittings which are to be encased in concrete where watertightness is to be obtained shall not be coated or painted on the outside.
8. Labels: In addition to the information required to be cast onto the pipe by AWWA C151, the letters "N.Y.C." shall be painted on the outside of each pipe, fitting, and special casting.
9. Pipe Couplings: Where flexible or rigid couplings are to be used, the exterior coating on the ends of pipe and fittings shall be left off for approximately eight inches, but the interiors shall be lined throughout.
10. Flange Joints: The back of the flanges and bolt holes shall be coated with asphaltic coating meeting the requirements of AWWA C151/A21.51, Section 51-8.1, immediately after facing and drilling.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All ductile iron pipe and fittings shall be installed in accordance with the manufacturer's recommendations, approved shop drawings and as specified in Division 1 and Section 02503 - Installation of Buried Pipelines and Section 15120 - Interior and Exposed Piping Schedule.
- B. Where insulation is shown or specified, it shall be installed after the installation and testing of the pipe and accordance with Section 15081 - Piping Insulation of the Plumbing Contract.
- C. Where field cutting of ductile iron pipe is permitted by the Commissioner, ductile iron pipe shall be cut only by means of abrasive saws, hack saws, wheel type cutters or milling type cutters. The use of "squeeze" type pipe cutters and cutting torches will not be permitted. Also, the use of diamond points and dog chisels will not be permitted.

- D. Erecting Exposed Piping: All piping shall be erected to accurate lines and grades, permanently supported as shown, specified or required. Where temporary supports are used during construction, sufficient strength and rigidity shall be provided to prevent shifting or distortion of the pipe.
- E. Supports for Exposed Piping: All exposed pipe, fittings and special castings not in trench or beneath floor structures shall be supported in conformance with Section 15060 - Hangers and Supports and as required by the Contract Drawings.
- F. Supports for Piping Below Floors: Pipe which run beneath ground floors of plant structures shall be encased in concrete to form an integral part of the floor slab or be suspended from the floor slab by approved pipe hangers encased in concrete.
  - 1. Where pipe are contiguous with floor structures, the pipe shall be encased in concrete. The reinforcement in the floor slab shall be placed and bent so that the pipe encasement is an integral part of the concrete structure.
  - 2. Where pipe are below floor structures, the pipe shall be supported by concrete encased adjustable clevis hangers anchored to the floor by means of bearing plates. Supports shall conform to the requirements of Section 15060 - Hangers and Supports. Hangers shall be spaced not more than five feet apart.
  - 3. Concrete for encasement shall be class 40 conforming to the requirements of Section 03300 - Cast-in-Place Concrete. There shall be a 3-inch minimum depth of concrete between reinforcement and pipe or hanger components, and a 3-inch minimum depth covering on reinforcement.
- G. Expansion: Ample provisions for flexibility in all pipelines shall be made to compensate for expansion.
  - 1. Adequate expansion devices shall be provided to allow the lines to expand and contract freely without damage to any part of the piping system.
  - 2. Expansion couplings shall be adjusted after installation so that the pipelines will be fluid-tight through the full range of operating conditions.
- H. Pipe Identifications Signs: Where shown or specified, pipe identification signs shall be furnished and installed in conformity with Section 15076 - Piping and Equipment Identification.
- I. Venting: All pipelines for liquids with air or gas shall be furnished with vent valves at all high points in the lines. Vent valves shall be of an approved design and adequately sized. Where vent valves are located that liquids can discharge and cause damage to a structure or equipment, pipe shall be piped from the vent valve to the nearest gutter or drain in an approved manner.

J. Temporary Bulkheads

1. Temporary bulkheads shall be furnished at the ends of pipe sections where adjoining pipe have not been completed and are not ready to be connected.
2. All temporary bulkheads shall be removed when they are no longer needed.

3.02 LEAKAGE TESTS

- A. All pipes shall be flushed and cleaned after installation.
- B. Pipes shall be tested for leaks in accordance with Section 02505 - Leakage Testing.

3.03 DISINFECTION

- A. All potable water pipes shall be disinfected before they are placed into service, as specified in Section 15141 - Disinfection.

3.04 SCHEDULES

- A. Refer to the Schedules contained in Section 02503 - Installation of Buried Pipelines and Section 15120 - Interior and Exposed Piping Schedule for information on the piping that is to be constructed using the pipe materials and methods specified herein.

-END OF SECTION-

**Section 15052**  
**STEEL AND STAINLESS STEEL PIPE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing steel and stainless steel pipe and cast, forged and fabricated steel fittings, stainless steel fittings, flanges, unions and couplings, complete with coating, wrapping, lining, insulation, and painting.

**1.02 RELATED SPECIFICATIONS**

- |    |               |   |   |
|----|---------------|---|---|
| A. | Section 01330 | - | Shop Drawings   |
| B. | Section 02503 | - | Installation of Buried Pipelines  |
| C. | Section 02505 | - | Leakage Tests   |
| D. | Section 05081 | - | Galvanizing   |
| E. | Section 07845 | - | Annular Space Seals   |
| F. | Section 09911 | - | Exterior Painting   |
| G. | Section 09912 | - | Interior Painting   |
| H. | Section 15051 | - | Ductile Iron Pipe   |
| I. | Section 15053 | - | Aluminum, Copper and Brass Pipe   |
| J. | Section 15056 | - | Pipe Couplings  |
| K. | Section 15060 | - | Hangers and Supports  |
| L. | Section 15076 | - | Piping and Equipment Identification   |
| M. | Section 15081 | - | Pipe Insulation for Pipes and Fittings Exposed to Atmosphere after Installation |
| N. | Section 15120 | - | Interior and Exposed Piping Schedule  |
| O. | Section 15141 | - | Disinfection  |

**1.03 REFERENCES**

- |    |           |   |  |
|----|-----------|---|--|
| A. | AWWA C203 | - | Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied |
| B. | AWWA C205 | - | Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied |
| C. | AWWA C207 | - | Steel Pipe Flanges for Waterworks Service - Size 4 In. Through 144 In.                             |
| D. | AWWA C208 | - | Dimensions for Fabricated Steel Water Pipe Fittings  |
| E. | AWWA C210 | - | Liquid Epoxy Coating Systems for Interior and Exterior of Steel Water Pipelines                    |

- F. AWWA C214 - Tape Coating Systems for the Exterior of Steel Water Pipelines
- G. AWWA M11 - Steel Pipe - A Guide for Design and Installation
- H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- I. ASTM A105/  
A105M - Forgings, Carbon Steel, for Piping Components.
- J. ASTM A106 - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
- K. ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings
- L. ASTM A139 - Electric-Fusion (ARC)-Welded Steel Pipe (NPS4 and Over)
- M. ASTM A193/  
A193M - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- N. ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for Hi-Temp
- O. ASTM A197 - Cupola Malleable Iron
- P. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- Q. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes
- R. ASTM A307 - Carbon Steel Bolts and Studs, 50,000 psi Tensile
- S. ASTM A312/  
A312M - Seamless and Welded Austenitic Stainless Steel Pipes
- T. ASTM A380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems
- U. ASTM A403/  
A403M - Wrought Austenitic Stainless Steel Piping Fittings
- V. ASTM B98 - Copper Silicon Alloy Rod, Bar, and Shapes
- W. ASTM F491 - Specification for Poly (Vinylidene Fluoride) (PVDF) Plastic-Lined Ferrous Metal Pipe and Fittings

- X. ASTM F492 - Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings
- Y. ASTM F599 - Specification for Poly (Vinylidene Chloride) (PVDC) Plastic-Lined Ferrous Metal Pipe and Fittings
- Z. ASME B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form)
- AA. ASME B16.1 - Cast Iron Flanges and Flanged Fittings, Class 25, 125, 250, 800
- BB. ASME B16.3 - Malleable-Iron Screwed Fittings, 125 and 250 lb.
- CC. ASME B16.4 - Cast Iron Threaded Fittings
- DD. ASME B16.5 - Pipe Flanges and Flanged Fittings, with Appendices
- EE. ASME B16.9 - Wrought-Steel Butt Welding Fittings
- FF. ASME B16.11 - Forged Steel Fittings, Socket-Welding and Threaded
- GG. ASME B16.21 - Non-Metallic Gaskets for Pipe Flanges
- HH. ASME B18.2.1 - Square and Hex Bolts and Screws
- II. ASME B31.1 - Power Piping
- JJ. ASME B31.3 - Process Piping
- KK. ASME 31.8 - Gas Transmission and Distribution Systems
- LL. ASME B36.10M - Welded and Seamless Wrought Steel Pipe
- MM. ASME B36.19M - Stainless Steel Pipe.
- NN. National Sanitation Foundation (NSF) 61 - Drinking Water System Components - Health Effects.
- OO. NFPA 54 - National Fuel Gas Code
- PP. New York City Building Code Section P115.0 - Gas Piping
- QQ. 16 NYCRR 255 - Transmission and Distribution of Gas
- RR. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings



- SS. ANSI B16.9 - Standard for Factory Made Wrought Steel Butt Welding Fittings

#### 1.04 DESIGN REQUIREMENTS

- A. In general, pipes shall conform to the applicable provisions of the Code for Pressure Piping, ASME B31.1 and its Supplements and specifically to Chapters 2, 4, and 5 of Section 6 - Fabrication Details except for plumbing and low pressure (15 psig maximum) heating lines.
- B. Pipe and fittings shall conform to the New York City Building Code in respect to plumbing and other applications covered by these codes.
- C. Only NSF61-approved materials shall be used in potable water lines.

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Submit working drawings, shop drawings and material specifications including, but not limited to:
  - 1. Flanged, screwed, welding and mechanical coupling fittings and pipe, couplings, harnessing and special fittings. When special designs or fittings are required, the work shall be shown in large detail and the special or fitting completely described and dimensioned.
  - 2. Fully dimensioned layout of pipe, fittings, couplings, sleeves, expansion joints, supports, anchors, harnessing, valves and equipment. Pipe size, type and materials shall be labeled on the drawing and the schedule included.
  - 3. Cross sections showing elevation of pipe, fittings, sleeves, couplings, supports, anchors, harnessing, valves and equipment.
  - 4. Schedules of pipe, fittings and valves; such schedules shall indicate the material and schedule number of thickness of all pipe, the material and class of all fittings and the rating and description of all valves.
  - 5. Details of pipe coating, wrapping, lining, insulation and painting.
  - 6. Expansion joints, flexible piping and flexible couplings with harness details where such harnesses are specified or where required, for a complete working installation.
  - 7. Locations where pipe and valve identification signs will be placed.

8. Catalog data for pipe, couplings, harnessing and fittings.
  9. Other piping appurtenances.
- C. Quality Control: Submit the following certifications:
1. Certificate of compliance for pipe, fittings, couplings, sleeves, cleanouts and harnessing.
  2. Certificate from an independent testing laboratory, approved by the City of New York, for each welder assigned to the welding of pipe, fittings and pipeline equipment.

#### 1.06 QUALITY ASSURANCE

- A. The pipe and fittings covered by these Specifications shall be provided by the Contractor through qualified manufacturers experienced in the fabrication and manufacture of the pipe materials specified herein. The pipe and fittings shall be designed, fabricated and installed in accordance with the standards specified.
- B. Certified welders, having current certificates conforming to the requirements of the ASME code shall be utilized to perform all welding on steel pipes. Welders shall be qualified under the requirements of Section IX Welding Qualifications of the ASME Boiler and Pressure Vessel Code.
- C. The manufacturer's name or trademark, the year of manufacture and the ASTM or API specification number shall be rolled or permanently inscribe on the pipe surface at the manufacturer's plant. As an alternate, the manufacturer's name or trademark, year of manufacture and ASTM or API specification number may be stenciled on the pipe surface. Pipe 1-1/2 inches and less in nominal diameter shall be bundled and tagged.
- D. Pipe and fittings manufactured outside of the continental United States must meet all the requirements of the latest ASTM standards referred to hereinbefore and, unless waived in writing by the City of New York, shall undergo physical tests and chemical analyses to prove compliance therewith. Such tests and analyses shall be performed by an independent testing laboratory approved by the City of New York. If the testing laboratory is located outside the United States, then the Contractor shall pay all costs for two City of New York personnel to witness such tests. The test samples shall be selected and tested in conformance with ASTM requirements. The City of New York may at its discretion visit the test facility and witness the tests. The cost of all physical tests and chemical analyses shall be borne by the Contractor.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Pipe, fittings and couplings shall be delivered, stored and handled in accordance with Division 1, General Requirements and as follows.
- B. When required for maintaining its circular shape and preventing distortion, each length of pipe shall be temporarily braced with an approved type of internal spider in each end of the pipe during erection.
- C. Handling Coated Pipe
  - 1. Coated pipe shall be protected at all times and handled with equipment designed to prevent damage to the coating, such as stout wide canvas slings and wide padded skids. The use of bare chains, cables, hooks, metal bars or narrow skids in contact with the coating will not be permitted. All pipe handling and hauling equipment shall meet the approval of the Commissioner before use. Ample provision shall be made for the prompt and efficient repair of all abrasions and injuries. Care shall be exercised in laying and cradling the pipe to prevent injury to the coating.
  - 2. When shipped by rail, pipes shall be loaded on properly padded saddles not less than six inches in width. Pipes shall be separated so that they do not bear against each other, and the whole load shall be securely fastened together and to the cars to prevent movement in transit.
  - 3. All pipe coating injured in any way during transit or laying shall be satisfactorily repaired prior to placing the backfill.

**PART 2 PRODUCTS****2.01 STEEL PIPE**

- A. Dimensions for steel pipe shall be in accordance with ASME B36.10M and as specified herein.

<b>Pipe Diameter (in.)</b>	<b>Schedule/Thickness</b>	<b>Standard</b>
Up to and Including 12	40	ASTM A53
Gas Piping up to 12	40	ASTM A106
14 to 24 Inclusive	3/8 in.	ASTM A53
30	3/8 in.	ASTM A139

**2.02 STEEL FITTINGS**

- A. Fittings shall be manufactured to standard dimensions, suitable for the pressures specified. Fittings shall be provided of the same or heavier wall thickness as the

pipe of which they are a part. Strength, physical and chemical requirements shall meet or exceed the requirements specified for the pipe.

- B. Fittings used in pipelines 2-inch diameter or smaller shall be of the screwed pattern, except as shown or specified otherwise.
- C. Fittings used in pipelines 2-1/2-inch diameter or larger shall be of the seamless steel welded type or flanged type, except as shown or specified otherwise.
- D. Unions: Screwed unions shall be used on all steel pipelines 2-inch diameter and smaller.

- 1. An adequate number of unions of the screwed or flanged type shall be provided in each main pipe and each branch to facilitate the dismantling or removal of any branch line or any part thereof or the section of the main pipe to which it connects, without disturbing adjacent branch lines or their related main pipeline.
- 2. Where sleeve-type (harnessed) groove-type or shouldered-end flexible pipe couplings, are specified, they may be considered as substitutes for pipe unions.

E. Screwed Fittings

- 1. Screwed fittings 2-inches and smaller shall be malleable iron flat band fittings, ASME B16.3, 125 pounds. For high-pressure service, conform to ASME B16.3, 250 lbs. Malleable iron shall conform to the requirements of ASTM A197.
- 2. Where shown or specified, screwed end fittings of cast iron, conforming to the requirements of ASME B16.4, 125-pound standards for general service and 250-pound for high pressure service shall be provided. Cast iron shall meet the requirements of ASTM A126.
- 3. All threads shall be clean cut and smooth conforming to the American Standard for Pipe Threads, ASME B1.1. Fittings shall be with right and/or left hand threads as required.
- 4. Unions and railroad unions and union elbows and tees shall be malleable iron fitted with brass to iron seats unless otherwise specified.

F. Socket Welding Fittings

- 1. Where shown or specified, steel socket welding fittings shall be provided on 3 inches and smaller services for high pressure gas, oil or where otherwise shown. Steel socket fittings shall conform to the requirements of ASME B16.11 with steel conforming to ASTM A105/A105M, Grade 2. Fittings shall be rated at 2000 pounds (minimum).

2. Socket welding fittings shall be welded in conformity with the applicable provisions of the Code for Pressure Piping, ASME B31.1.

G. Butt Welding Fittings

1. Butt welding fittings shall meet the requirements of ASME B16.9.
2. Outlets for welded connections that are made with welded half coupling shall be of the butt welding type.
3. Outlets for threaded connections shall be made with threaded half couplings.
4. Where welding fittings are approved for assembly in the cement lined pipelines, fittings shall be provided with a plain end, grooved end or shouldered end section welded on each end of the fitting and assembled with sleeve-type, groove-type or shouldered-end couplings as required. Long tangent welding fittings may be submitted for approval as a substitute for welded-on spool piece fittings provided that they can accommodate flexible pipe couplings.

H. Flanged Fittings

1. Where shown on the Contract Drawings or where specified, cast iron or steel flanged fittings shall be provided.
2. Cast iron flanged fittings for general service shall conform to the requirements of ASME B16.1.
3. Steel flanged fittings shall utilize forged steel slip-on flanges. Fittings shall be Class 125 and Class 250 fittings conforming to the requirements of ASME B16.5, 150 pound or 300 pound, respectively, as specified, except flanges that are plain faced shall be provided. Provide Class 125 fittings conforming to AWWA C207, Class B.
4. Cast steel flanged fittings shall be assembled with forged steel flanges of the same pressure rating, conforming to the requirements of ASME B16.5.

2.03 CARBON STEEL PIPE AND FITTINGS FOR NATURAL GAS SERVICE

A. General

1. Steel pipe for natural gas service shall conform to ASTM A106, with a minimum wall thickness of Schedule 40.
2. Natural gas piping shall have a maximum carbon content of 0.32% and shall be in conformity with the requirements of New York State Rules and

Regulations of the Public Service Commission 16 NYCRR Chapter 111 Gas Utilities, Subchapter C Safety, Part 255 Transmission and Distribution of Gas (16 NYCRR 255). Natural gas piping shall also conform to the requirements of the New York City Building Code Section P115.0 – Gas Piping, the National Fuel Gas Code - NFPA 54, and the standards of the natural gas supplier.

3. For buried gas piping, pipe shall be coated steel pipe with a cathodic protection system to prevent corrosion. Piping may either have factory-applied protective coating (mill wrapped) or be field wrapped. All bare sections of pipe and fittings shall be field coated and wrapped in accordance with the standards of the natural gas supplier.

#### B. Joints

1. Joints shall be welded.
2. All field pipe welds shall be ultrasonically inspected in accordance with API Spec 5L. All welds on gas piping shall be radiographically inspected in accordance with 16 NYCRR 255 and inspections shall be scheduled so as not to interfere with the work of other trades, at no additional cost to the City of New York. Repair any defect disclosed by the test and retest the joint at no additional cost.
3. The pipe ends shall be prepared for the jointing system specified for the pipe. Ends for welding shall be beveled in accordance with ASME B31.8 at 30 degrees with a maximum of 37-1/2 degrees.
4. All welds shall be free from burrs, snags or rough projections.

#### C. Fittings

1. Flanged fittings shall conform to the dimensional requirements of ASME B16.5, except that slip-on flanges shall not be used. Flanges shall be weld neck or threaded end. Fittings fabricated in conformance with ASME B16.9 shall be of the same wall thickness as specified for the pipe.
2. Bell type reducers are not acceptable; only cone type reducers shall be used.

#### D. Cathodic Protection

1. Insulating joints: Insulating couplings or fittings shall be used to electrically separate the underground portion of steel piping from the above ground piping or piping in the building. Locate insulators on the above ground portion of a riser and on the pipe immediately after entering the building wall. No other connections shall be made to the underground portion of the piping that could result in an electrical ground to the piping. Use either insulating unions,

threaded or insulating couplings, or insulating flanges. Insulated compression couplings shall be used on outdoor installations only.

2. Magnesium anodes: electrically attach magnesium anodes to underground steel piping. One 3-pound anode shall be installed where the total underground piping length is 10 feet or less. When the total length of underground piping is greater than 10 feet, install one 17-pound magnesium anode for every 100 feet of underground piping.
3. Bury the anode ingot in the soil approximately 2 feet to the side and below the level of the piping at a location near the center of the section of pipe being protected. Follow manufacturer's recommendations for burying the anode.
4. Attach the wire lead to a bare steel area of pipe. After attaching, restore the coating in the area so that no bare metal remains.

## 2.04 FABRICATED STEEL FITTINGS

- A. Fittings shall be shop fabricated from a segmental welded steel section of a plate thickness not less than that specified for pipe connected thereto. The minimum radii of the centerlines of the bends shall be 1.5 times the nominal pipe diameter unless otherwise specifically shown on the Contract Drawings. The included angle between the points of tangency of the bend and connecting straight pipe shall contain not less than the number of bend segments called for in the following table:

Bend	Number of Full Segments	Number of Part Segments
75°-90°	4	2
60°-74°	3	2
45°-59°	2	2
30°-44°	1	2
0°-29°	0	2

1. Full segments shall consist of sections with ends cut to form included angles of 15 degrees; part segments shall consist of sections up to 7-1/2 degrees. In accordance with the above table, a 90 degree bend would require four 15 degree segments, two 7-1/2 degree segments at the ends of the fitting and one additional 15 degree segment; a 45 degree bend would require two 15 degree segments and two 7-1/2 degree segments.
- B. Fittings for cement-lined pipelines shall be lined after fabrication of the fittings.
- C. Cement-lined fabricated fittings shall be installed with flexible pipe couplings. Such fittings shall be provided with extra long end segments extending past the

point of tangency of the radius to the segment centerline to accommodate the couplings.

- D. Fabricated fittings installed with couplings shall be provided with extra long end pieces to suit the coupling. Sleeve-type or shouldered-end couplings provided shall meet the requirements of Section 15056 - Pipe Couplings. Collared end pieces shall be provided for shouldered-end couplings.
- E. Reducers and increasers shall be provided with the same laying length as American Standard Class 125.
- F. Fabricated steel fittings shall be provided with plain ends or welded flanges.
- G. Tees, wyes, laterals and outlets shall be reinforced in accordance with AWWA Manual M11.

## 2.05 FLANGES AND FLANGED JOINTS

- A. Flanges: Unless otherwise shown, all flanges for steel pipe, except blind flanges shall be of the slip-on welding type with hubs meeting the requirements of ASME B16.5. Where specifically captioned on the Contract Drawings or where explicitly required by the Specifications, furnish and install steel pipe flanges complying with AWWA Standard C207 as required. Welding neck steel flanges, ASME B16.5, may be submitted to the Commissioner for approval in place of slip-on flanges.
  - 1. Slip-on flanges shall be welded to the steel pipe at the hub and at the pipe end in conformity with the Code for Pressure Piping, ASME B31.1, Section 6.
  - 2. Plain faced blind flanges in accordance with ASME B16.5 shall be provided.
  - 3. Standard raised faces flanges shall be provided for the sizes specified except for cast iron-to-steel joints which shall be plain faced.
  - 4. Steel 150 pound welding flanges shall be used for assembly with Class 125 cast iron flanged fittings, steel 300-pound flanges with Class 250 cast iron flanged fittings, and AWWA Class B steel hub flanges with 25 pound cast iron flanged fittings.
- B. Flanged Joints: Flanged joints shall be made with bolts or bolt studs with a nut on each end. Stud bolts shall be used for all bolting sizes 1-3/4 inches and larger.
  - 1. Bolts, stud bolts, and nuts shall meet the requirements of ASTM A307 Grade B, except for high temperature service where alloy steel bolts, ASTM A193/A193M, Grade B5, shall be used. Bolts and stud bolts shall conform to the dimensional requirements of ASME B18.2.1 with rolled threads conforming to ASME B1.1, Coarse Series, Class 2 fit. Bolts and stud bolts and nuts shall be of American Standard heavy unfinished hexagonal type.



2. Bolts shall be provided with a 1/4-inch projection beyond the nut when joint with gasket is assembled.
- C. Gaskets: Ring type gaskets shall be provided for pipe larger than 12 inches in diameter, and full face gaskets for pipe sizes 12 inches in diameter and smaller with dimensions in conformity with the requirements of ASME B16.21, unless specified otherwise. Gaskets shall be as thin as the finish and accuracy of the surfaces will permit.
1. For general service, rubber gaskets shall be 1/8-inch thick and meet the requirements of AWWA C207 as modified and supplemented herein.
  2. Gasket material that is provided shall be specifically recommended for the service by the gasket manufacturer and as approved by the Commissioner.
- D. Insulation: Insulated flanged joints shall be provided as required. Flange insulation kits shall include flange insulating gasket, flange bolt insulating sleeves, and flange bolt insulating washers.

## 2.06 COUPLINGS

- A. Where shown on the Contract Drawings, specified or required for the convenience of installation, pipe couplings conforming to the requirements of Section 15056 - Pipe Couplings shall be furnished and installed.
- B. Harnessed sleeve-type couplings shall be used close to the connecting point for pipe connections to pumps and other equipment handling fluids or gases under 200°F susceptible to damage or binding due to pipe strain unless other types of flexible connections are shown or specified.
- C. Cement-lined fabricated fittings shall be assembled with flexible pipe couplings. Where butt welding fittings are approved for assembly in cement lined pipes, fittings shall be provided with spool pieces welded on each end and, assembled with flexible pipe couplings after cement lining. Where harnessed joints are required on lined pipe, the harnessing lugs shall be welded before lining.
- D. Where pipelines pass from a concrete structure into earth, flexible couplings shall be installed at the face of the structure and at a point about four feet from the structure to protect the pipe against damage by displacement or settling.

## 2.07 EXPANSION JOINTS

- A. Where shown on the Contract Drawings, specified or required, the Contractor shall provide internally guided, packed sleeve type expansion joints, in which the traverse slip section functions correctly without leakage at the maximum estimated expanded position at full operating pressure.

- B. Unless specified otherwise, on pipes 3 inches nominal diameter and smaller, expansion joints with screwed ends, of all bronze or brass construction shall be provided.
- C. On pipelines 4 inches and larger, expansion joints with ANSI Class 125 flanged ends, cast semi-steel bodies and brass sleeves shall be provided.
- D. Ample space shall be provided for packing, with packing material suitable for the service and pressure specified. Where specified or shown, integrally cast anchor bases suitable for anchor bolting shall be provided.
- E. Expansion joints shall be installed so that the traverse can move only in a direction parallel to its centerline in conformity with the requirements of the Code for Pressure Piping, ASME B31.1, Paragraph 612.

## 2.08 WALL SLEEVES

- A. Suitable ductile iron or steel pipe sleeves shall be provided at all points where pipes pass through the walls or floors of structures, and where wall castings are not provided.
- B. Ductile iron sleeves shall be provided as specified in Section 15051 - Ductile Iron Pipe.
- C. Steel sleeves 12 inches in diameter and larger shall be provided with a minimum wall thickness of 0.375 inches. Steel sleeves smaller than 12 inches in diameter shall be provided not less than Schedule 40. Steel sleeves shall be provided with an intermediate collar located at the center of the wall. The O.D. of the collar shall be four inches greater than the O.D. of the sleeve, fabricated from steel plate with a minimum thickness equal to the sleeve thickness and double welded to the sleeve.
- D. Modular mechanical-type seals consisting of interlocking synthetic rubber links or blocks shaped to continuously fill the annular space between the pipe and the wall sleeve shall be provided. Where pipes pass from a fire rated area to a non-fire rated area, annular space seals with a 2 hour minimum fire rating shall be provided, meeting the requirements of Section 07845 - Annular Space Seals. The elastomeric element/s shall be of the size, quantity, type and material that the manufacturer recommends for the intended service.

## 2.09 CLEANOUTS

- A. Where shown on the Contract Drawings or specified, flanged cleanouts shall be provided as specified in Section 15051 - Ductile Iron Pipe.

## 2.10 COATINGS AND LININGS

- A. General: Carbon steel pipes shall be lined and coated in accordance with the piping schedule included in Section 02503 – Installation of Buried Pipelines and Section 15120 – Interior and Exposed Piping Schedule.
1. All bolts, nuts, couplings and the like shall be coated after the joint has been made.
  2. Painting shall be in accordance with Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable.
  3. Pipe and fittings that are to be encased in concrete shall not be painted.
- B. Tape Coating: Where shown, specified or required for exterior coating of buried piping multi-layered, cold-applied tape in accordance with AWWA C214 shall be provided.
- C. Liquid Epoxy: Where liquid epoxy lining and coating is shown, specified or required, lining and coating shall be in accordance with AWWA C210, at twice the standard thickness.
- D. Cement-Mortar Lining
1. The pipe and fittings shall be lined before installation in conformity with the requirements of AWWA C205. The lining shall be shop applied. A seal of asphaltic material shall be provided in conformity with AWWA C203.
  2. Fabricated pipe and fittings shall be cement lined after fabrication.
  3. Cement linings for steel pipe and fittings shall conform to the thicknesses as given in AWWA C205 and the following table:

Nominal Pipe Size Inclusive (Inches)	Lining Thickness (Inches)	Tolerance (Inches)
1¼ - 1½	3/32	-1/64 +1/64
2 - 2½	1/8	-1/32 +1/32
3 - 3½	5/32	1/32 +1/32

4. Shop and field cutting of cement-lined pipe will be permitted only by methods specifically approved by the Commissioner, in each case; field cutting will only be permitted if witnessed by the Commissioner.
5. Caps, plugs, sleeves and valve box castings shall not be cement lined but shall receive a liquid epoxy coating as specified under Paragraph C above.

- E. Galvanizing: Galvanizing shall be provided in accordance with ASTM A53 where shown or specified.
- F. Coating Exposed Threads of Buried Galvanized Pipe: Where galvanized pipe is buried underground and joined by means of screwed fittings, a protective zinc dust coating shall be applied to the exposed threads in the field. Do not leave any exposed metal uncoated.
- G. Urethane Coating: Urethane coating shall be provided in accordance with Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable, where shown, specified or required.

## 2.11 HEAVY WALL STAINLESS STEEL PIPE AND FITTINGS

- A. Heavy wall stainless steel pipe and fittings shall be Type 316L stainless steel fabricated in accordance with ASTM A312/312M for nominal pipe sizes up to twelve (12) inches.
- B. Wall thickness shall be Schedules 40S or 80S pipe in accordance with ANSI B36.19 and as indicated on the piping schedule in Section 15120 - Interior and Exposed Piping Schedule.
- C. Where flanges are shown, specified or required for connection of stainless steel pipe and fittings to pipe equipment, forged stainless steel slip-on flanges conforming to ANSI 150 pound or 300 pound standards, shall be provided, welded at the hub and at the face. Flanges, flanged fittings and flanged joints shall conform to the applicable provisions specified herein for steel flanges, flanged fittings and flanged joints, except that steel bolting shall be cadmium plated to produce a uniform appearance.
- D. Fittings
  - 1. For nominal pipe sizes two (2) inches and smaller shall be of the socket-welding type conforming to the dimensional requirements of ASME B16.11.
  - 2. For nominal pipe sizes 2-1/2 inches and larger shall be the butt-welding type conforming to the dimensional requirements of ASME B16.9.
  - 3. Fittings shall conform to the materials and alloy requirements of ASTM A403/A403M.
- E. All stainless steel pipe and fittings shall be precleaned, pickled and passivated after fabrication in accordance with the applicable sections of ASTM A380, except where otherwise specified.

**2.12 STAINLESS STEEL TUBING AND FITTINGS**

- A. Type 316L stainless steel, seamless tubing shall be in accordance with ASTM A269 for pipe sizes less than 1-1/2 inches.
- B. Wall Thickness
  - 1. Tubing shall be as follows:

Nominal Size (Inches)	Rating (psi)	Wall Thickness (Inches)
1/4	3000	0.035
3/8	2500	0.035
1/2	2500	0.049
5/8	2500	0.049
3/4	2500	0.065
1	2000	0.065

- C. Type 316 stainless steel, flareless tube fittings in conformity with ASTM A276 shall be provided.
- D. Dielectric insulating joints or fittings shall be provided at connections between exterior piping and interior piping.
- E. All stainless steel tubing shall be precleaned, pickled and passivated after fabrication in accordance with the applicable sections of ASTM A380, except where otherwise specified.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Pipe and fittings in accordance with the manufacturer's recommendations and approved shop drawings.
- B. Welding of Pipe and Fittings
  - 1. No field welding of stainless steel will be permitted.
  - 2. Welding of steel butt-welding fittings, steel fabricated fittings and steel pipe shall be in strict conformity with the Code for Pressure Piping, ASME B31.1, Section 6 and its Supplements. Certificates of qualification of current issue, conforming to the requirements of the Code, shall be submitted to the Commissioner before proceeding with any pipe welding.

3. Backing rings shall be used for all pipe welding butt joints unless otherwise specified. Backing rings shall be of carbon steel with spacer nubs that strike-off or melt with the weld.

C. Welding of Cement Lined Pipe and Fittings

1. Welding of cement lined steel pipe will be permitted only with the approval and under the observation of the Commissioner where such welding is shown on the Contract Drawings or specified.
2. In addition to the welding qualifications specified under Section 3.01B hereinbefore, welding procedures shall conform to the requirements specified herein.
3. The ends of the lined pipe for pipe-to-pipe joints shall be machine cut to provide an approximate bevel of  $27\frac{1}{2}$  degrees. Ends may be chipped provided there is no damage to the cement lining. Ends shall be cleaned of scale, rust, oil and other foreign matter. Where fittings already having a bevel of  $37\frac{1}{2}$  degrees are to be welded to pipe, pipe ends shall be bevelled to a  $17\frac{1}{2}$  degree angle, making a total angle of bevel between joints approximately 55 degrees. A  $\frac{1}{8}$ -inch land shall be provided where possible.
4. Parts to be joined shall be approximately  $\frac{1}{32}$  inch apart before tacking. Backing rings shall not be used at welded joints. Small tack welds shall be made using a  $\frac{1}{8}$ -inch electrode. The first bead or layer of welding shall be laid by bridging across from bevel to bevel at the bottom of the groove just at the top of the land. A suitable crown reinforcement layer shall be made on the top of the joint to finish off.
5. Direct current (dc) shall be used for welding, with the base material on the negative side.
6. The first pass shall be a stringer bead using a  $\frac{1}{8}$ -inch electrode with a current of 80 to 90 amperes at 50 to 55 volts. The second and succeeding passes shall be woven beads using a  $\frac{1}{8}$ -inch electrode and a current of 90 to 100 amperes at 55 to 58 volts. All passes shall be made slowly and with care not to burn through the land or the shoulder into the lining of the pipe. The joint shall not be hotter than 100 F. For large size pipe, a  $\frac{5}{32}$ -inch electrode may be used, provided the temperature of the joint is held within this limit.
7. No stress-relieving of welded joints is necessary unless the pipe wall thickness warrants it. After the weld is completed, the joints in the lining shall be filled with a special compound of a wet slurry mix of the same cement used for the lining. Where accessible from the end of the pipe, the welded joint shall be swabbed with cement using a paint brush thoroughly wetted with the cement slurry.

8. Any defects causing leaks in welded joints shall be repaired by welding without damaging the cement lining using procedures similar to that specified hereinbefore.

D. Expansion

1. Ample provisions for flexibility in all pipelines shall be made to compensate for expansion.
2. Adequate expansion devices shall be provided to allow the lines to expand and contract freely without damage to any part of the piping system.
  - a. Expansion devices in the form of expansion joints, expansion couplings, swivel or swing joints or pipe bends, including such anchors as may be shown, specified or required to make the devices effective shall be provided.
  - b. If expansion devices are not required, all runs of pipe subject to expansion shall be fabricated shorter than their theoretical length to the extent that there is freedom to expand without increasing the stresses imposed when cold.
3. Swing Joints
  - a. On pipelines 2 inches or less, rated at water working pressures up to 150 psi, screwed end swing or swivel joints may be used; otherwise expansion shall be taken up with nipples and fittings as required.
  - b. A sufficient number of fittings and pipe lengths in connection with swing joints shall be provided to assure the absence of distortion of either the pipelines or branches. Branch tees from the risers shall be located so that when the branch lines therefrom expand by heat, the branches will continue to drain properly.
4. Pipe Expansion Bends
  - a. Pipe bends of approved design for compensating thermal expansion when shown, specified or required shall be fabricated and furnished as herein specified.
  - b. In pipelines operating under high pressures or high temperatures in which offsets occur in alignment that may be subject to bending stresses excessive for the fittings, or where otherwise deemed necessary, use appropriate pipe bends to make the offset.

- c. Where possible, all bends shall have radii equal to a least six diameters of the pipe and tangents or straight lengths of the pipe shall be neatly made, true to radius, free from buckles and flat surfaces.

#### E. Erecting Uncoated Pipes

1. Uncoated pipe shall be erected in accordance with the best piping practice with a minimum exposure to the elements and to other corrosive conditions.
2. Before erection, all uncoated pipes shall be placed on end and hammered to remove scale and loose particles.
3. Screwed end pipe: Pipe ends shall be reamed after pipe is cut to final length. Threads shall be cleanly cut to the dimensions of the American Standard for Pipe Threads, ASME B1.1. All burrs, dirt and foreign matter shall be removed and an application of pipe compound given to the threads of both pipe and fittings before assembly. Compound shall be eliminated at the inside of the joint. Once a joint has been tightened, it shall not be backed off unless all threads are re-cleaned and new compound applied.
4. Pipe compounds: For general service, use an approved mastic metallic compound, Teflon tape, or approved equal shall be used. On oil lines, an approved compound resistant to oil shall be used. For potable water lines a NSF61 approved pipe compound shall be used.
5. All piping shall be erected to accurate lines and grades, permanently supported as shown, specified or required. Where temporary supports are used during construction, sufficient strength and rigidity shall be provided to prevent shifting or distortion of the pipe.
6. Expansion couplings shall be adjusted after installation so that the pipelines will be fluid-tight through the full range of operating conditions.

#### F. Venting. All pipelines for liquids shall be provided with adequately sized, approved, air or gas vent valves at all high points in the lines, even though such vent valves may not be shown on the Contract Drawings and/or approved shop drawings.

1. Where vent valves are so located that liquids discharged therefrom would cause damage to structure or equipment, the vent valve shall be piped to the nearest gutter or drain in an approved manner.

#### G. Drainage

1. Pipelines for air, gas or steam shall be provided with approved means for condensate drainage even though such means may not be shown on the Contract Drawings and/or approved shop drawings. Drainage from gas lines



shall be provided through an approved, double valved, manually operated condensate trap or as otherwise shown.

2. An approved means for draining low points in all liquid system pipes shall be provided whether or not such drainage systems are shown on the Contract Drawings and/or approved shop drawings.
- H. Hangers and Supports: All pipelines shall be permanently erected with supporting devices furnished and installed in conformity with requirements of Section 15060G - Hangers and Supports and the applicable provisions of the Code for Pressure Piping, ASME B31.1, Section 6.
- I. Connection of Cast Iron Bell and Spigot Pipe to Steel Pipe: Where connection is required between steel and cast iron pipe, a sleeve-type transition coupling meeting the requirements of Section 15056 - Pipe Couplings shall be provided.
- J. Insulation: Where shown or specified, insulation shall be provided in conformity with Section 15081G - Piping Insulation for pipes and fittings that are exposed to atmosphere after installation.
- K. Reducing Fittings: Ample fittings shall be used for all changes in pipe size. Bushings shall not be used.
- L. Pipe Identifications Signs: Where shown or specified, pipe identification signs shall be furnished and installed in conformity with Section 15076G - Piping and Equipment Identification.

### 3.02 CLEANING

- A. During construction, all piping shall be thoroughly cleaned before placement and the lines kept free from foreign matter of whatever origin. The pipes shall be left thoroughly clean to the satisfaction of the Commissioner.

### 3.03 TESTING

- A. All pipes shall be flushed clean and tested after installation.
- B. Pipes shall be tested for leaks and repaired as required in accordance with Section 02505 - Leakage Tests.
- C. Pressure test shall be as specified in Section 02503 - Installation of Buried Pipelines and Section 15120 - Interior and Exposed Piping Schedule.

3.04 PAINTING

- A. Where shown, specified or required, pipes shall be painted in conformity with the requirements of Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable.

3.05 SCHEDULES

- A. Schedules of the piping that is to be constructed using the pipe materials and methods specified herein are contained in Section 15120 - Piping Schedules and Section 02503 – Installation of Buried Pipelines.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15053  
COPPER PIPE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes all copper pipe and fittings, including all insulation, painting and related work as shown on the Contract Drawings, specified or required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 02505 - Leakage Tests
- C. Section 07845 - Annular Space Seals
- D. Section 15051 - Ductile Iron Pipe
- E. Section 15052 - Steel and Stainless Steel Pipe
- F. Section 15056 - Pipe Couplings
- G. Section 15060 - Hangers and Supports
- H. Section 15076 - Piping and Equipment Identification
- I. Section 15081 - Piping Insulation
- J. Section 15120 - Interior and Exposed Piping Schedules
- K. Section 15141 - Disinfection

**1.03 REFERENCES**

- A. ASTM B32 - Solder Metal
- B. ASTM B42 - Seamless Copper Pipe, Standard Sizes
- C. ASTM B88 - Seamless Copper Water Tube
- D. ASTM B124 - Copper and Copper Alloy Forging Rod, Bar and Shapes
- E. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube
- F. ASME B1.20.1 - Screw Threads - Pipe Threads, General Purpose (Inch)
- G. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings (Includes Revision Service)
- H. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fitting (Includes Revision Service)
- I. ASME B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings Class 150, 300, 400, 600, 900, 1500 and 2500

J. ASME Code, Section VIII, Appendix bb

K. National Sanitation Foundation (NSF)

1.04 DESIGN REQUIREMENTS

A. Copper pipe and fittings shall conform to the latest Building Code of the City of New York in respect to plumbing and other applications covered by these laws.

B. Copper pipe shall conform to the latest standards of the American Society for Testing and Materials (ASTM), the American National Standards Institute (ANSI), the American Society of Mechanical Engineers (ASME), the Aluminum Association (AA), the Copper and Brass Research Association (CABRA), the Society of Automotive Engineers (SAE), the Manufacturer's Standardization Society (MSS), the American Welding Society (AWS), and National Pipe Thread (NPT).

C. Use only NSF61-approved materials in potable water lines.

1.05 SUBMITTALS

A. Provide all submittals, including the following, in accordance with Section 01330 - Shop Drawings.

B. Submit the following shop drawings before fabricating or installing pipe.

1. Complete detailed shop drawings in conformance with the specified requirements. Include all data pertinent to the layout of the pipe even though such information is not specifically mentioned in the Specifications.
2. Drawings that show completely dimensioned piping layouts and schedules of all pipe, fittings, valves, expansion joints, flexible couplings, hangers, supports and other appurtenances.
3. Schedules of pipe, fittings and valves. Denote the material and thickness or class of all pipe, the type and material of all fittings and the rating and description of all valves.
4. Details of insulation, painting and similar work for all piping.
5. Details and materials of the support and hanging of pipe.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

A. The following manufacturers are acceptable.

1. Pipe and Fittings

- a. Mueller Industries, Inc., Wichita, KS
- b. IBCO, Elkhart, IN
- c. Or approved equal

2. Flared Tube Fittings

- a. Parker Hannifin Corp., Triple-Lok Fittings
- b. Or approved equal

**2.02 MATERIALS**

A. Copper Pipe and Fittings

1. Small Copper Piping: For copper pipe 3 inches in diameter and smaller, provide Type K seamless, round, hard drawn copper tubing that meets ASTM B88 requirements. Provide tube sizes, dimensions and wall thickness conforming to ASTM B88, Table 1 for Type K tubing, unless otherwise specified. Provide nominal lengths of hard copper tubing in straight lengths of approximately 20 feet, unless otherwise specified.

a. Fittings: For copper tubing, use solder joint or flared end type fittings, as specified. No bending of hard copper tubing will be permitted, unless otherwise specified; make all bends and connections with suitable fittings.

(1) Provide flared tube fittings meeting the requirements of the SAE Hydraulic Tube Fittings standard. After flaring, anneal the joints before assembly. Flared fittings shall be of brass half-hard bar stock, ASTM B 16 (SAE 72) or of brass forgings, ASTM B 124, Alloy Number 2 (SAE 88). Assemble couplings and fittings to prevent overstressing the tubing. Where required, use anti-seize lubricating compound to prevent galling and to facilitate assembly.

(2) Solder Joint Fittings: Provide ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and copper alloy fittings. Braze solder joint fittings and tubing in conformity with the specifications of Section 3 of the CABRA Copper Tube Handbook. Brazing alloy shall be copper-phosphorus alloy, Class BCuP-5, as specified by American Welding Society Spec. AWS A5.8.

- b. Joints: Provide threaded or ASTM B32 lead-free soldered joints.
  - 2. Large Copper Piping: For copper pipe larger than 3 inches in diameter, provide regular seamless copper pipe that meets the ASTM B42 requirements.
    - a. Fittings: Provide solder type fittings of the same material as the pipe.
    - b. Joints: Use threaded or brazed joints.
  - 3. Potable Water Piping: Use ASTM B32 alloy Grade 95TA (95 percent tin and 5 percent antimony) solder for piping carrying potable water.
  - 4. Unacceptable Uses: Do not use copper pipe with soldered joints for transporting fuel oil or other flammable or toxic liquids inside buildings.
- B. Sleeves and Wall Castings: Unless otherwise shown or specified, furnish and install suitable pipe sleeves at all points where pipes pass through walls or floors of structures. Sleeve material shall be ductile iron or steel as shown on the Contract Drawings or specified. Ductile-iron sleeves shall conform to the requirements of Section 15051 - Ductile Iron Pipe, and steel sleeves shall conform to the requirements of Section 15052 - Steel and Stainless Steel Pipe.
- C. Modular, Mechanical Sleeve Seals: Provide modular, mechanical type seals consisting of interlocking, synthetic-rubber links shaped to continuously fill the annular space between the pipe and the sleeve. Provide an elastomeric sealing element that is of the size, quantity, type and material that the manufacturer recommends for the intended service and that will provide an effective hydraulic seal. Provide stainless steel bolts and nuts. Modular, Mechanical Sleeve Seals shall conform to section 07845 - Annular Space Seals.
- D. Drip pans shall be constructed of 16-gauge Type 316 stainless steel. If welding is required to construct the drip pan, Type 316L stainless steel shall be used.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install all pipe and fittings as specified, as shown on the Contract Drawings, and in accordance with the manufacturer's recommendations and approved shop drawings.
- B. Connections Between Dissimilar Metals: Where connections are to be made between pipelines or equipment of dissimilar metals, make the connections using dielectric insulating couplings, unions or other approved dielectric insulating devices.
- C. Reducing Fittings: Use reducing fittings for all changes in pipe size. Do not use bushings.

**D. Pipe Flexibility**

1. Make ample provisions for flexibility in all pipelines.
2. Install branch tees on risers in locations that will allow the branch lines, when expanded by heat, to drain properly.
3. Unless other forms of expansion compensation are specified, such as expansion joints, fabricate all runs of pipe subject to change in length shorter than their theoretical length to the extent of one half of the expansion and erect them such that they may be free to expand without increasing the stresses imposed when cold.
4. When the foregoing method of compensation for expansion is not adequate, furnish and install in the pipelines expansion devices adequate to allow the lines to expand and contract freely without injury to any part of the piping system. The devices may be in the form of expansion joints, swivel joints, swing joints, pipe bends or flexible couplings, and shall include such anchors as may be shown or required to make the devices effective. A sufficient number of fittings and pipe lengths shall be used in connection with swing joints to assure the absence of distortion of either the pipelines or branches. Application guide and anchor requirements for expansion joints shall be in accordance with the recommendations of the manufacturer or the Standards of the EJMA.

E. Hangers and Supports: Furnish and install supporting devices as specified under Section 15060 - Hangers and Supports.

F. Drip Pans: Provide drip pans under all metallic pipelines installed over electrical equipment and motors and conduct drainage to the nearest floor drain, gutter or other drainage system with 3/4-inch red brass pipe. Make the connection between the drip pan and the brass drain pipe leaktight, and pitch the drip pan uniformly toward the drain pipe at a slope not less than 1/8-inch per lineal foot.

G. Pipe identification signs and valve identification numbers shall be furnished and installed in conformity with Section 15076 - Piping and Equipment Identification.

**3.02 CLEANING AND TESTING**

A. Cleaning: During construction, clean all piping before placement and keep the lines free from every kind of foreign matter. All pipelines shall be left thoroughly clean to the satisfaction of the Resident Engineer. Flush all process and potable water pipelines with clean water.

B. Test all pipelines for leakage in conformance with Section 02505 - Leakage Tests.



**3.03 INSULATION**

- A. Piping insulation shall conform to Section 15081 - Insulation.

**3.04 DISINFECTION**

- A. Disinfect all potable water pipelines in accordance with Section 15141 - Disinfection.

**-END OF SECTION-**

**Section 15056**  
**PIPE COUPLINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide sleeve-type and groove-and-shoulder-type couplings in pipelines as shown, specified and required.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting
- C. Section 15051 - Ductile Iron Pipe
- D. Section 15052 - Steel and Stainless Steel Pipe

**1.03 REFERENCES**

- A. ASTM A47 - Ferric Malleable Iron Castings
- B. ASTM A193/A193M - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- C. ASTM A194/A194M - Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- D. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes
- E. ASTM A283/A283M - Low and Intermediate Tensile Strength Carbon Steel Plates
- F. ASTM A536 - Ductile Iron Casting
- G. ASTM A744 - Corrosion-Resistant Iron-Chromium-Nickel and Nickel-Base Alloy Castings for Severe Service
- H. ASTM B26 - Aluminum-Alloy Sand Castings
- I. ASTM D2000 - Classification System for Rubber Products in Automotive Applications
- J. ASME B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form)
- K. ASME B18.2.2 - Fasteners in Customary Uses - Hex Nuts
- L. ASME B31.1 - Power Piping

- M. AWWA C606 - Joints, Grooved and Shouldered Type
- N. AWWA Manual M11 - Steel Pipe - A Guide for Design and Installation

#### 1.04 DESIGN REQUIREMENTS

- A. Pipe couplings for making field joints between plain end, grooved end, and shouldered end pipe and fittings shall meet the requirements of the Code on Power Piping, ASME B31.1.
- B. Coupling design and construction shall facilitate easy assembly in the field.
- C. Flexible couplings shall be designed and constructed to insure permanently tight joints under all conditions of expansion, contraction, shifting and settlement to which the pipelines may be subjected as a result of the operation and layout of the process system in which they are installed.
- D. Rigid couplings shall be designed and constructed to provide a tight joint and prevent pipe movement at the joint.

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Submit completely detailed shop drawings including the following:
  - 1. Location in pipeline
  - 2. Catalog data showing dimensions and materials of component parts
  - 3. Harnessing, where required
  - 4. Working and test pressures

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. The following manufacturers are acceptable. Equivalent products from other manufacturers may be submitted for approval.
- B. Sleeve-type Couplings
  - 1. Dresser Manufacturing Div. of Dresser Industries, Inc.
    - a. For steel pipelines, Style 38

- b. For ductile iron pipelines
    - (1) 12" and smaller - Style 138
    - (2) larger than 12" - Style 38
  - c. To join different types and sizes of pipe, Style 162
- 2. Smith-Blair, Inc.
  - a. For steel pipelines, Type 411
  - b. For ductile iron pipelines
    - (1) 12" and smaller - Type 441
    - (2) larger than 12" - Type 411
  - c. To join different types and sizes of pipe, Type 441
- C. Groove- and Shoulder-type Couplings (Victaulic)
  - 1. For steel pipelines
    - a. Grooved, flexible, Style 77
    - b. Grooved, rigid, Style 07
    - c. Shouldered, Style 44
  - 2. For ductile iron pipelines
    - a. Grooved, flexible, Style 31 with flexible radius grooves
    - b. Grooved, rigid, Style 31 with rigid radius grooves
    - c. Shouldered, Style 31
  - 3. For stainless steel pipelines
    - a. Grooved, flexible, Style 77S
    - b. Grooved, rigid, Style 008
  - 4. For aluminum pipelines
    - a. Grooved, flexible, Style 77A
  - 5. For copper pipelines
    - a. Grooved, rigid, Style 606

6. For PVC pipelines
  - a. Grooved, flexible, Style 775
7. For High Density Polyethylene (HDPE) pipelines
  - a. Plain end, rigid, Style 995

D. Groove- and Shoulder-type Fittings

1. Victaulic Full-Flow Fittings
2. American Cast Iron Pipe Co.
3. U.S. Pipe and Foundry Co.

2.02 PRODUCTS

A. Couplings shall be either one of the following two types:

1. Sleeve-type couplings shall have a middle ring or sleeve placed around the pipe joint. The middle ring shall be sealed by two wedge-shaped gaskets evenly compressed by follower flanges or rings tightened by bolts and nuts.
2. Groove- and shoulder-type couplings shall have a C-shaped sealing gasket placed around the joint. The gasket shall be enclosed in a split-type housing that shall engage shoulders or grooves in the pipe. The housing shall be assembled by bolts and nuts.

B. Bolts and Nuts

1. Bolts for sleeve-type and groove- and shoulder-type couplings shall be Type 316 stainless steel, ASTM A 193/A 193M, Grade B8, Class 2. Nuts shall be Type 316 stainless steel conforming to ASTM A194/A194M. Bolts shall have American Screw Threads, Coarse Thread Series, ASME B1.1. Nuts shall be American Standard Heavy Dimension Series, ASME B18.2.2.
2. For all sleeve-type couplings, bolts shall be double radius head or button head track type. The collars under the heads shall fit oval or square holes in the follower rings.
3. For all groove-and shoulder-type couplings, bolts shall be track type oval neck bolts. The collars under the heads shall engage the oval slots in the housing.

C. Sleeve-type couplings shall be of steel construction for steel pipe lines. Sleeve-type couplings for ductile iron pipelines shall be constructed of ductile iron or steel for pipe sizes 12 inches and smaller and shall be constructed of steel for pipes larger than 12 inch.

## 1. For Steel Pipe Lines

- a. The middle ring or sleeve and the follower rings or flanges shall be steel, ASTM A 283/A 283M (Grade A). The middle ring or sleeve shall have flared or beveled ends. The follower rings or flanges and the middle ring or sleeve shall be true circular sections free from irregularities, flat spots or surface defects.
- b. The middle ring or sleeve shall not have a center pipe stop, unless otherwise specified, and shall have the following minimum dimensions:

Pipe Diameter (inches)	Middle Ring Thickness (inches)	Middle Ring Length (inches)
8 and Smaller	1/4	5
10-30	3/8	7
Over 30	1/2	10

- c. After welding, welded steel follower rings shall be sized and tested by cold expanding a minimum of one (1) percent beyond the yield point.

## 2. For Ductile Iron Pipe Lines

- a. The middle ring or sleeve shall be ductile iron, ASTM A536. The middle ring or sleeve shall have flared or beveled ends. Follower rings or flanges shall be of ductile iron, ASTM A536, or malleable iron, ASTM A47 (Grade 32510), for pipe sizes 12 inches and smaller, and shall be of steel ASTM A283/A283M (Grade A) for pipe larger than 12 inches.
  - b. The middle ring shall not have a center pipe stop, unless otherwise specified, and shall have the same minimum dimensions as specified above for couplings for steel pipe.
3. Gaskets shall be resilient, wedge-shaped gaskets with a maximum angle of 40 degrees at the wedge end. Gasket material shall be compatible with the type and temperature of the fluid in the pipeline, and shall be the material recommended by the manufacturer for the service if not specified elsewhere.
  4. The maximum working pressure of the sleeve-type couplings shall not be less than 250 psi for pipe sizes smaller than 54 inch, and not be less than 200 psi for pipe larger than 54 inch.

## D. Groove- and Shoulder-type Couplings

1. Couplings may be of the grooved type for steel pipe in sizes up to and including 24 inches. For steel pipe larger than 24 inches, suitable welded steel

collars, Victaulic Vic-Ring Type C or Type E, or approved equal, shall be welded to the pipe ends. Unless otherwise specified, groove-type couplings shall conform to the requirements of AWWA C606.

2. Housing shall be in two or more parts, closely fitting the pipe and gasket. Housing material shall be ductile iron, ASTM A536 (Grade 654512), except for stainless steel and aluminum pipelines, which shall have housings of Type 316 stainless steel, ASTM A744 Grade CF-8M, and aluminum, ASTM B26, Alloy 356-T6, respectively.
3. Gaskets shall be of materials compatible with the type and temperature of the fluid in the pipeline, and shall be of the material as recommended by the coupling manufacturer for the service if not specified elsewhere. Gaskets shall be molded so that internal pressure tightens the seal. All gaskets shall be continuous, uniform in texture, and free from surface blemishes and defects.

**E. Groove- and Shoulder-type Fittings**

1. Grooved end fittings for steel and ductile iron pipe in sizes up to and including 24 inches shall be cast of ductile iron with working pressure ratings not less than the following:

Nominal Pipe Size (Inches)	Working Pressure (psi)
3/4" - 6"	1,000
8" - 12"	800
14" - 22"	300
24"	250

2. For steel and ductile iron pipe larger than 24 inches, fittings shall be provided with shoulders. Working pressure ratings shall not be less than 150 psi. Fabricated steel fittings shall be provided with extra-long end pieces to suit the coupling.
3. Grooved end fittings for stainless steel pipe shall be Type 304 of the thickness schedule specified.
4. Grooved end fittings for aluminum pipe in sizes 1 inch through 8 inches shall be of aluminum alloy 356 T6 conforming to ASTM B26, and shall be equal to Victaulic full-flow aluminum fittings. Working pressure ratings shall be not less than 500 psi for fittings in sizes 1 inch through 6 inches and not less than 400 psi for 8-inch size fittings.
5. Grooved end fittings for copper pipe shall be provided with rolled grooves and shall be designed for a working pressure not less than 300 psi.

## 2.03 PAINTING

- A. All surfaces of the middle and follower rings of all sleeve-type couplings and the housing of all groove- and shoulder-type couplings shall be shop painted in conformance with the requirements of Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Ends of pipe, fittings and couplings shall be cleaned of all scale, dirt and thick outside coatings. Before assembly, the ends of pipe and/or fittings and the outside of the coupling gasket shall be lubricated as recommended by the manufacturer. Fasteners shall be assembled using a thread lubricant equal to G-N paste (Molycote) as manufactured by Dow-Corning.
- B. Couplings shall be assembled by tightening diametrically opposite bolts evenly and progressively. Bolts on sleeve-type couplings shall not be tightened beyond the point of stretching (when the mill scale on the shank begins flaking off). Bolts on groove- and shoulder-type couplings shall be tightened only until there is metal to metal contact between housing segments and the pipe.
- C. Field Assembly of Groove-type Couplings. Field grooving of pipe shall not be done unless approved by the Commissioner, and then shall be limited to steel pipe 24 inches or under nominal diameter and to ductile and cast iron pipe 12 inches or under nominal diameter. Field grooving shall be done only with special tools provided by the coupling manufacturer.
- D. Harness for Sleeve-type Couplings. In all pipelines under pressure, and elsewhere where shown, specified or required, sleeve-type couplings shall be harnessed.
  - 1. On steel pipe, unless otherwise specifically detailed or specified, cast steel "crow-foot" lugs shall be welded on diametrically opposite sides of the pipe, and the joint shall be harnessed with stainless steel tie-bolts and nuts. The dimensions, sizes, spacing and materials for lugs, tie-bolts and nuts shall be based on the use of two bolts and four lugs per joint, in conformity with Section 19.8 (Table 19.7) of AWWA Manual M11 or the standard specifications of the coupling manufacturer for the pipe size, wall thickness and test pressure specified. Welding shall conform to the requirements specified under Section 15052 - Steel and Stainless Steel Pipe.



2. On ductile iron pipe, unless otherwise shown or specified, couplings shall be harnessed with stainless steel tie bolts and nuts connected to flanges or fittings installed on the pipe on each side of the coupling as shown, specified or required for the pipe sizes and specified test pressures. The harnessed length from flange to flange shall not exceed 3 feet.

-END OF SECTION-

**Section 15058**  
**HOSE REEL ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section includes the requirements for furnishing and installing service water hose reels, non-collapsible rubber hoses, and hose nozzles. Hose reel and accessories shall be provided, assembled as necessary, and installed where shown on the Contract Drawings or as required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 – Shop Drawings
- B. Section 01821 – Training
- C. Section 01831 – Operation and Maintenance Manuals
- D. Section 02505 – Leakage Tests
- E. Section 15076 – Piping and Equipment Identification
- F. Section 16050 – Basic Electrical Materials and Methods
- G. Section 16055 – Electrical Requirement for Shop Assembled Equipment
- H. Section 16220 – Electric Motors

**1.03 REFERENCES**

- A. New York City Building Department requirements
- B. New York City Department of Environmental Protection (NYCDEP), Bureau of Water Supply Standard Water Main Specifications

**1.04 SUBMITTALS**

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Shop Drawings: Submit working drawings, including arrangement and erection drawings, equipment and control equipment; schematic control diagrams; electrical connection diagrams; and complete description of the control system.
- C. Provide manufacturer's data showing capacity of the reel, motor Hp, hose and nozzle performance, system pressures and other operational parameters.
- D. Provide Operation and Maintenance manuals in accordance with Section 01831 – Operation and Maintenance Manuals.

## 1.05 SPARE PARTS

- A. The equipment manufacturer shall submit for approval a spare parts list in accordance with the procedures and requirements set forth in the General Conditions.
- B. The complete list of parts and supplies shall include current unit prices and source of supply.
- C. The complete list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified herein to be furnished as part of the Contract.
- D. A list of additional items recommended by the manufacturer to assure efficient operation at the particular installation. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. A separate number shall properly identify each part. Those parts, which are identical for more than one size, shall have the same parts number. Lists specified in paragraphs A and C above shall be submitted with the operation and maintenance manual.
- E. The following spare parts shall be supplied with the equipment:
  - 1. 100 ft length of 1½" rubber hose
  - 2. 1-set hose fittings/adaptors
  - 3. 1-complete nozzle assembly

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Use every precaution to prevent damage to the hose reels during transportation and delivery to the site.
- C. If, in the process of transportation or handling, any hose reel or accessory is damaged, replace or repair such reel or reels. Make all required repairs.
- D. Delivery: Ship each hose reel complete, with no field assembly or fabrication required.

## PART 2 PRODUCTS

### 2.01 HOSE REELS

- A. Provide 1½-inch power driven hose reels capable of storing 100-feet of 1½-inch non-collapsible rubber hose. Provide hose reels constructed of Type 304 stainless

steel. Provide hose reels having electric motor rewind with auxiliary hand crank. Provide a minimum ½-horsepower motor rated at 120-volt A.C. Motors shall comply with applicable portions of Section 16050 – Basic Electrical Materials and Methods, Section 16055 - Electrical Requirements for Shop-Assembled Equipment, and Section 16220 – Electric Motors.

- B. Provide adjustable spring tension pinion brake and spring-actuated pin lock. Also supply a manual clutch reeducation unit.
- C. Provide four-way roller assembly with stainless steel housing. Provide swivel joint inlet with 1½-inch female NPT threads. Provide outlet with 1½-inch male NST threads. Hose reels shall be suitable for mounting on floors or walls.
- D. Provide controls for motor rewind to control the speed of the rewind and a momentary contact (dead man) switch to provide power to the reel.
- E. Hose reels shall be manufactured by: Hannay Reels, of Westerlo, NY, Model number: SSEP 7526-33-34-10.5RT, or approved equal

#### 2.02 NON-COLLAPSIBLE RUBBER HOSE FOR HOSE REELS

- A. For each hose reel provide a non-collapsible rubber hose assembly having a single length of 100 feet with no intermediate couplings. Hose assemblies shall include hose, end couplings, washers and appurtenances necessary for a complete assembly. Non-collapsible rubber hose assemblies shall be installed on the hose reels.
- B. Hose: Provide 1½-inch, spiral braid wrapped synthetic rubber hose rated for working pressure of 150 psig and burst pressure of 600 psig. Hose coating shall be oil resistant and kink resistant.
- C. Connections: Provide the hose assembly with any fittings, such as hose shanks and other items, as necessary to connect the hose to the end couplings. All couplings and fittings shall be stainless steel.
- D. Acceptable manufacturers are listed below.
  - 1. Goodyear Rubber Products Corporation, of North Brunswick, NJ
  - 2. Abbott Rubber Company, of Elk Grove Village, IL, Type 1112-1502-50
  - 3. Or Approved Equal

#### 2.03 ADJUSTABLE GALLONGE NOZZLES FOR HOSE REELS

- A. For each hose reel provide a 1½-inch inlet pistol grip nozzle. Nozzles shall be of aluminum or stainless steel construction. Nozzles shall have a protective corrosion resistant coating. Nozzle shall provide varying flow patterns and varying flow rates. Nozzles shall include a ball shut off. Nozzles shall have female connections and rated for working pressure of 150 psig.

B. Acceptable manufacturers are listed below.

1. LDM Products, Saugerties, NY
2. W.S. Darley & Co., Melrose Park, IL
3. Or approved equal

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Hose reel assemblies shall be installed in strict accordance with the most recent installation instructions provided by the hose reel manufacturer, local ordinance, recognized engineering procedure, and other applicable codes.
- B. Equipment identification shall be in accordance with Section 15076 - Piping and Equipment Identification.

#### 3.02 TESTING

- A. After the installation of the hose reel assemblies, subject the equipment to a field running test under actual operating conditions. Perform field test as directed and in the presence of the Commissioner. Perform the field test to demonstrate that under all conditions of operation the unit:
1. Has not been damaged by transportation or installation
  2. Has been properly installed
  3. Has no mechanical defects
  4. Has been properly connected
  5. Is in proper alignment
  6. Is free of overheating of any parts
  7. Is free of all objectionable vibration
  8. Is free of excessive noise
  9. Is free of overloading of any parts
  10. Operates as specified with the control system
- B. Promptly correct any defects in the equipment or failure to meet the requirements of the Specifications.
- A. Leakage tests shall be performed in accordance with Section 02505 – Leakage Tests.

#### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Services: The Contractor shall retain the services of the Supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to

check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

3.04 TRAINING

- A. Provide training in accordance with Section 01821 – Training.
- B. The manufacturer of the Hose reel shall include one hour of on-site classroom and hands-on.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15060**  
**HANGERS AND SUPPORTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall provide all hangers, supporting devices and appurtenances shown, specified or required for pipes, fittings, valves and other in-line equipment.
- B. Included in this classification are rod hangers; clevis hangers, spring hangers; stanchion, roller and pipe pole supports and saddle stands; supports of structural steel; concrete saddles, concrete anchor blocks and bases, and all necessary guides, restraints, fastening devices, anchor bolts, pipe anchors and appurtenances.
- C. Contractor shall provide all temporary pipe supports required during construction.
- D. Contractor shall design all piping support systems in accordance with the requirements of this Specification unless otherwise shown or specified.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 05081 - Galvanizing
- C. Section 05500 - Metal Fabrications
- D. Section 09911 - Exterior Painting
- E. Section 09912 - Interior Painting

**1.03 REFERENCES**

- A. The Manufacturers Standardization Society of the Valve and Fitting Industry:
  - 1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture
  - 2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
  - 3. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
  - 4. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports.
- B. Federal Specification, FS W-H-171 - Hangers and Support, Pipe.
- C. Underwriter's Laboratories, Inc., Standard UL-203 - Pipe Hanger Equipment.
- D. ASTM A 36 - Standard Specification for Carbon Structural Steel.



- E. ASTM A 48 - Standard Specification for Gray Iron Castings.
- F. ASTM A 276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
- G. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
- H. ASTM A778 - Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
- I. ASME - B31.1 - Power Piping.
- J. N.Y. Spec 32-P-6 - Pipe, Special Castings, Valve Box Castings: Cast-Iron.
- K. New York City Building Code.
- L. EJMA - Expansion Joint Manufacturers Association.
- M. NFPA 13 - Installation of Sprinkler Systems.

#### 1.04 DESIGN REQUIREMENTS

- A. Contractor shall provide hangers and supports of sufficient strength to maintain the pipelines and appurtenances in proper position and alignment under all operating conditions.
- B. Contractor shall provide the services of a New York State Registered Professional Engineer to design the supports for all pipelines and appurtenances, for all weights, forces and applied pressures. In the design of hangers, supports and anchors, unless otherwise shown or specified, pipe pressures shall be the maximum test pressures specified for pipelines carrying gases and twice the maximum test pressures specified for pipelines carrying liquids. The pipe support designer shall have a minimum of three (3) years experience in the design of pipe supports and have completed successful pipe support projects of equal complexity as the systems specified.
  - 1. Pipe support design shall include load and movement calculations.
  - 2. The following loads shall be included in pipe support design and pipe stress analysis:
    - a. Gravity Force, including weight of pipeline and appurtenances, contents, insulation, etc.
    - b. Thermal Expansion Force developed by the restraint of free end displacement of the piping.

- c. Hydrostatic Forces developed by internal pressure during operation of the piping system.
  - d. Loading due to expansion joint reaction forces.
  - e. Seismic forces, as required by the New York City Building Code.
- 3. Supports, guides and anchors for flexible couplings and expansion joints shall be in accordance with the coupling and joint manufacturer's specification and the standards of the Expansion Joints Manufacturers Association.
- 4. Wherever possible, pipe supports shall be designed using manufacturer's standard catalog products.
- 5. Hangers and Supports for piping systems subject to thermal expansion and contraction, or to similar movements imposed by other sources, shall be designed to provide flexibility, and pipe stress analysis shall be provided.
- 6. Where resonance with imposed vibration and/or shock occurs during operation, suitable dampeners, restraints, anchors, etc., shall be added to remove those effects.
- 7. Occasional load calculations and pipe stress analysis shall be provided where required by Building Codes or Standards. Occasional loads include:
  - a. Seismic forces
  - b. Pressure waves produced by sudden changes in fluid momentum, commonly referred to as water hammer
  - c. Wind, snow or ice loads
  - d. Safety valve thrust loads
- 8. Stressors in hangers, rods and brackets shall be in accordance with Table 2 of MSS-SP-58.
- C. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69 and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.
- D. Unless otherwise approved, all hangers, supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.

## E. General Requirements

1. Pipe and appurtenances connected to equipment shall be supported in a manner to prevent any stress being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, certification shall be submitted stating that requirements have been complied with.
2. Where practicable, piping shall be run in groups and parallel to building walls. A minimum clearance of one inch shall be provided between pipe and other work.
3. Hangers or supports shall be provided at all locations where piping changes direction.
4. Hangers and supports shall be capable of adjustment after placement of piping.
5. Types of hangers and supports shall be kept to a minimum.
6. Suspended or supported ductile iron pipe shall have a hanger or support adjacent to each hub or flanged end.
7. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.
8. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
9. Contact between dissimilar metals shall be prevented by use of copper plated, rubber or vinyl coated hangers or supports.
10. Hangers and supports shall provide for expansion and contraction throughout the full operating temperature range.
11. Any required pipe supports, for which the supports called for in this Specification are not applicable, shall be fabricated or constructed from standard stainless steel shapes, concrete and anchor hardware, and shall be subject to the approval of Commissioner.
12. Where hanger or support spacing does not correspond with joist or rib spacing, structural steel channels shall be attached to joists or ribs, and the pipes suspended there from.
13. All hanger rods shall be double nutted at each hanger or support.

14. All threaded assemblies shall be double nutted or provided with pinned nuts. Alternately, tack welding of bolted assemblies may be acceptable unless provisions for vertical adjustment are required.
15. Except where otherwise shown or required, horizontally valves 6-inches and larger shall be supported on each side of the valve, by pipe hangers or supports.
16. At all flexible couplings, supports shall be placed on each side and as close to the coupling as possible. Supports shall be the guide type that prevents axial movement from resulting in pipe deflection and misalignment.
17. Supports, anchorage and guidance for grooved end pipe shall be in accordance with the applicable sections of these specifications and the recommendations of the manufacturer.

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Contractor shall submit the following for approval:
  1. Name and qualifications of the support and hanger engineer.
  2. Detailed Working Drawings showing all hangers and supports for each piping system. Working Drawings shall show location, installation, material, loads, forces, stresses and deflections of all hangers and supports. Reaction forces imparted to structures to which hangers and supports are attached shall be shown.
- C. Contractor shall submit the following product information for approval:
  1. Manufacturer's catalogs and engineering data on all hangers and supports
  2. Load ratings
  3. Materials
  4. Installation details
- D. Contractor shall submit all drawings and design calculations signed and sealed by a New York State registered professional engineer.
- E. Contractor shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device. At a minimum, the Contractor shall submit:
  1. Scaled details of the device with dimensions.
  2. A table of applied forces and moments.

3. A complete bill of materials.
4. An isometric showing the applied forces and moments.
5. Detailed connections to existing structure.
6. Shop and field welds.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Equipment and materials shall be delivered to the site to insure uninterrupted progress of the Work. Pipe hanger inserts that are to be embedded in cast-in-place concrete shall be delivered in ample time not to delay the Work.
- C. Equipment and materials shall be stored to permit easy access for inspection and identification, and shall be kept in covered storage off the ground, using pallets, platforms or other supports. They shall be protected from condensation, corrosion and deterioration.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Pipe hangers, supports and appurtenances shall be standard products of the manufacturers.
- B. Each type of hanger and support shall be the product of a single manufacturer.

#### 2.02 MATERIALS

- A. Materials for hangers and supports of metallic construction shall conform to ASME B31.1 and to the following standards:
  1. Structural Steel, ASTM A 36 and A 283
  2. Iron Castings, ASTM A 48 (Class No. 35)
  3. Stainless Steel, ASTM A 276
    - a. Type 316 stainless steel for non-welded items
    - b. Type 316L stainless steel for welded or fabricated items
    - c. Tensile Strength: 70,000 psi minimum
    - d. Yield Strength: 25,000 psi minimum
    - e. Elongation in 2 inches: 35%
    - f. Reduction of area: 45%
  4. Stainless Steel Pipe and Tube, ASTM A 778, Type 316L stainless steel

- B. Pipe supports, hangers, brackets, guides, restraints, rods, bolts, nuts and anchors shall be Type 316 stainless steel. Concrete inserts shall be of malleable iron with galvanized finish.
- C. Pipe rolls, including stands and bases, shall be of cast iron, hot-dipped galvanized conforming to ASTM A123.
- D. Only new materials shall be provided.
- E. Hangers and supports shall conform to MSS-SP-58, Table 2.
- F. Proprietary fiberglass reinforced plastic supports and hangers for use with small diameter chemical and thermoplastic pipe shall be as specified in the piping specification and approved by the Commissioner.
- G. Expansion anchors for use in existing concrete structure shall be made of Type 316 stainless steel.

## 2.03 HANGERS AND SUPPORTS

- A. Hangers and supports where shown shall be in accordance with the Contract Drawings. Hangers and supports not shown shall comply with MSS SP-58.
- B. All hangers and supports shall allow minimum 3-inches of vertical adjustment.
- C. Hangers and Supports shall be of the following types:
  - 1. Hangers for Single Pipes
    - a. Single pipes shall be supported by hangers suspended by rods from structural steel members, inserts in concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets. The strength of the rod shall be based on its root diameter.
    - b. Except for piping subject to thermal expansion and contraction or as otherwise specified, pipe hangers shall be adjustable clevis type MSS SP-58 Type-1.
    - c. Piping subject to thermal expansion and contraction shall be supported on rollers.
  - 2. Hangers or Supports for Multiple Pipes
    - a. Multiple pipes, running parallel in the same horizontal plane and adjacent to each other, shall be suspended by trapeze type hangers or supported on wall brackets. Trapeze hangers shall consist of channel

sections supported from threaded rods or attached to concrete walls, columns or structural steel support members.

- b. Except as otherwise specified herein, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets, shall be anchor or pipe chairs as required.

### 3. Supports for Single Pipe

- a. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Contract Drawings.
- b. Pipes shall be supported by adjustable stanchions, pipe saddle or roll supports with "U" bolts. Stanchions shall provide at least 4-inches adjustment and be flanged-mounted to floor.
- c. Stanchions and saddle stands shall be of Type 316L stainless steel.
- d. Pipe pole supports for pipe runs above ground, out-of-doors, and where otherwise required, shall consist of a suitable length of stainless steel pipe set upright in at least four feet of concrete; two stainless steel angles secured to the top of the pipe, at right angle and on each side; a stainless steel plate welded to the top of the angles to serve as a horizontal support for the pipes. Supports shall be provided with attachments in the form of stands, clamps, rolls, rods or similar devices of the screw adjustable type in the vertical direction.
- e. Where specified or shown, column supports of built-up welded stainless steel shall be provided, as approved by the Commissioner.
- f. Pipe rollers shall be cast ductile iron unless otherwise shown or specified. Hardware and appurtenances shall be stainless steel.

- 4. Wall Supported Pipes: Single or multiple pipes located adjacent to walls, columns or other structural members, and an excessive distance from ceilings or underside of beams, shall be supported using stainless steel wall brackets, MSS SP-58 Type 32 or 33. Where pipes rest on top of bracket pipe supports, attachments shall meet the requirements specified under Paragraph 2.b above.
- 5. Supports for Base Elbows: Where pipes change direction from horizontal to vertical through a bend, a welded or cast base anchor support shall be installed at the bend to carry the load.
- 6. Supports for Vertical Pipes: Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs. Riser clamps shall be MSS SP-

58 Type 42 or 8. Insulation shall be removed from insulated pipes prior to installing riser clamps.

7. Supports for Pipelines with Thermal Expansion

- a. Pipe rolls for single rod hangers: Stainless steel frame construction, ductile iron roller and stainless steel roller rod provided with threaded nuts; vertical adjustment permitted; for pipe sizes 6 inches or less unless otherwise approved.
- b. Pipe rolls for double rod hangers: Ductile iron roller, stainless steel roller rod, malleable iron threaded sockets which permit vertical adjustment.

8. Supports for Pipelines Subject to Temperatures Greater than 300 F: Spring hangers of heavy stainless steel construction.

9. Supports for Thermoplastic Pipes: All thermoplastic pipe attachments shall have a continuous bearing cradle or saddle on the lower 120 degrees of pipe circumference and a minimum length of one quarter pipe diameter, but not less than 6 inches nor more than 12 inches.

10. Supports for Copper & Brass Pipes: All copper and brass pipe supports shall be specifically manufactured for use with copper & brass pipe. Hangers shall be provided with a copper finish.

11. Hangers for Radiators

- a. Support wall hung radiators on approved wall brackets or overhead hangers.
- b. Support wall hung radiators by all-metal brackets and plates that are screw adjustable after erection. Wall plates shall be made of stainless steel of size and shape to insure rigidity and strength and with a minimum resistance to expansion. Plates shall be fastened directly to walls, columns or pilasters with at least one 1/2-inch bolt, and with spacing of brackets not in excess of 42-inches.
- c. Where rod hangers are specified or shown supporting wall radiators, supporting rods shall be not less than 5/8-inch in diameter.

12. Concrete Supports

- a. Where pipeline or mechanical equipment is shown, specified or required to be supported on concrete supports, supports shall be as specified herein.



- b. Concrete supports for equipment shall be of a size and mass that will resist all forces, both static and dynamic, which may be developed by the equipment.
- c. Concrete supports for pipe, fittings, valves and appurtenances shall be designed to carry the weight of the pipeline and appurtenances. Cradles and anchor blocks shall safely withstand all stresses imposed by the pipelines, under all operating conditions. Concrete cradles shall be shaped to fit the contour of the pipe.
- d. Concrete supports shall be anchored to the floor of main structures by doweling or other approved means. Anchor bolts, extension plates, saddle yokes and other hold-down devices in concrete bases shall be placed before pouring of concrete. Expansion bolts shall not be used on new concrete supports except with the specific approval of the Commissioner.
- e. Concrete supports shall be not less than Class 25 as specified in Section 03300 - Cast-in-Place Concrete.

## 2.04 ACCESSORIES

### A. Hanger Rods

1. Material shall be Type 316 stainless steel. Maximum allowable working stress shall be 5,800 psi, calculated based on the root diameter.
2. Rods shall have a square head nut on top and running thread on bottom end. Hanger rods for single pipe hangers shall be sized in accordance with the following schedule:

<b>Hanger Rod Diameter (Minimum)</b>			
<b>Pipe Size (inches)</b>	<b>Single Rod (inches)</b>	<b>Double Rod (inches)</b>	<b>Maximum Load Per Hanger (lbs)</b>
1/2 to 1-1/2, incl	3/8	3/8	300
2	3/8	3/8	325
2-1/2	1/2	3/8	350
3	1/2	3/8	400
3-1/2	1/2	3/8	450
4	5/8	1/2	850
5	5/8	1/2	950
6	3/4	5/8	1075

<b>Hanger Rod Diameter (Minimum)</b>			
<b>Pipe Size (inches)</b>	<b>Single Rod (inches)</b>	<b>Double Rod (inches)</b>	<b>Maximum Load Per Hanger (lbs)</b>
8	*7/8	5/8	1350
10	*7/8	5/8	1750
12	*7/8	3/4	2200
14	*1	7/8	2500
16	*1	7/8	3075
18	*1	7/8	3700
20	*1-1/4	1	4425
24	*1-1/4	1	6050

\* To be used subject to the Commissioner's specific approval

- a. Hanger loads shall be calculated based on the weight of pipe filled with water plus 50 pounds per foot of dead load.

**B. Concrete Inserts, Attachment Plates and Clamps**

1. Hanger rods up to 7/8-inch diameter shall be attached to new concrete structures using concrete inserts MSS SP-58, Type 18. Inserts shall be malleable iron with galvanized finish. The use of steel inserts is prohibited. Design of the inserts shall permit the rods to be adjusted laterally in one plane and to lock the rod nut or head to the body. The inserts shall be provided with openings or recesses to receive reinforcing rods. To facilitate installation, slots shall be provided in the exposed flanges of the insert. Inserts shall be rated to safely carry the maximum load that can be supported by the hanger rod.
2. Hanger rods larger than 7/8-inch diameter shall be attached to new concrete by means of approved hook anchors as shown on the Contract Drawings.
3. Hanger rods shall be attached to existing concrete structures using stainless steel expansion anchors as specified in Section 05500 – Metal Fabrications.
4. Steel beam clamps shall be malleable iron and conform to MSS SP-58 Type 28 or 29 for wide flange or I-beams, and Type 20 for channel sections or where it is necessary to locate the hanger rod off the beam centerline.
5. Steel U-shape beam attachments welded to the underside of beams, and welded steel brackets fastened to structural steel columns, shall be subject to

specific approval of the Structural Steel and Pipe Supports Working Drawings.

## 2.05 PIPE INSULATION PROTECTION

- A. Contractor shall furnish steel protection saddles on all supports for insulated pipe.
  - 1. For pipe sizes less than 12 inches in diameter, provide saddles of No. 14 U.S. gauge stainless steel curved 180 degrees for use with roller hangers or structural trapeze hangers and of No. 16 U.S. gauge stainless steel curved 120 degrees for use in clevis hangers. Saddles shall be at least 12-inches long. Saddle gripping side edges shall be turned up at least to the thickness of insulation.
  - 2. For pipe 12 inches in diameter and larger, provide saddles of No. 12 U.S. gauge stainless steel with a welded centerplate to provide three-edge support. Saddles shall be at least as long as the pipe diameter, provide 120 degree coverage and have edge and centerplate depths equal to the insulation thickness.
- B. Before placing the saddles, saddles shall be filled with either insulating cement or high-density insulation cut to fit. For vapor barrier insulation, the barrier must be maintained; contact between hanger and support and bare pipe will not be permitted.

## 2.06 PIPE ANCHORS AND BRACES

- A. Anchors and sway braces shall be provided when required to hold the pipelines and equipment in position or alignment. Pipe anchors and braces for rigid fastening to the structures shall be attached to stainless steel anchor plates and anchor bolts set into the forms when placing concrete of new structures. Brackets and braces shall be attached to existing concrete structures with through bolts or expansion anchors.
- B. Anchors, guides and restraints shall be provided for the proper operation of pipeline expansion joints.
- C. Cast iron anchors shall be provided with stainless steel straps on piping, except where anchors form an integral part of pipe fittings and couplings or where an anchor of special design is required or shown on the Contract Drawings.
- D. All pipe anchors, guides and restraints shall be designed to conform to ASME B31.1.

## 2.07 INSPECTION

- A. The City of New York may elect to conduct shop inspections. The inspections may include but not be limited to: mechanical and chemical testing, material sampling,

material certifications, traceability of parts, blasting and painting, visual and dimensional inspection, and free iron contamination check on stainless steel parts.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Hangers, supports, and accessories shall be located within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.
- B. Hangers or supports shall be provided at all locations where piping changes direction.
- C. Hangers and supports shall be located to prevent vibration or swaying and to provide for expansion and contraction.
- D. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
- E. Concrete embedded items shall be installed before concrete placement.
- F. Embedded items shall be fastened securely to prevent movement during concrete placement.
- G. Hanger and support unit installation methods shall be in accordance with manufacturer's recommendations.
- H. Hangers and supports shall be adjusted and grout placed as specified in Section 03300 to bring pipelines to specified elevations.

#### 3.02 SPACING OF HANGERS AND SUPPORTS

- A. Supports and Hangers for Horizontal Pipes
  - 1. Supports and hangers for all piping shall be placed no farther apart than shown below, unless otherwise shown or specified:
    - a. Ductile Iron, Steel and Stainless Steel Pipe
      - (1) Maximum spacing in accordance with Table 3 of MSS-SP-69. The designer should check the capacity of the steel or building structure to which the hanger or support is attached, and adjust the maximum spacing accordingly.
      - (2) In addition, ductile iron pipe shall have a minimum of two supports per length and shall have a hanger or support adjacent to each end.

## b. Thermoplastic Pipe

- (1) Pipes up to 1-inch: 2 feet-6 inches center to center.
- (2) Pipes 1-1/2-inch to 3-inch: 4 feet-0 inches center to center.
- (3) Pipe 4-inch to 8-inch: 6 feet-0 inches center to center.
- (4) Pipes larger than 8-inch: 8 feet-0 inches center to center.

## c. Tubing less than 1-inch diameter: In accordance with best piping practice and ASME B31.1, and as approved by the Commissioner.

2. Additional supports shall be placed immediately adjacent to any change in piping direction, at equipment, and on both sides of valves, expansion joints and couplings.

## B. Supports for Vertical Piping

1. Riser clamp shall be placed under hub, fitting or coupling with approved solid bearing on steel sleeve.
2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration. Maximum spacing shall not exceed 25 feet.
4. Base elbows or welded equivalent shall be provided at vertical piping bases.
5. Top support shall have a horizontal connection, and provide for pipe expansion.

## C. Pipelines installed under plumbing work shall be spaced in conformity with the requirements of the New York City Building Code or as specified.

## 3.03 PAINTING AND COATING

- A. Painting shall be in conformity with Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable.
- B. Surfaces of hangers and supports in contact with aluminum, brass, plastic and copper pipelines or pipeline equipment shall be protected with an approved plastic coating to prevent abrasion. Touch-up shall be provided in the field, as required. Coating shall be applied in accordance with the manufacturer's recommendations, and shall be free from spots and brush marks, to the satisfaction of the Commissioner.

3.04 TESTING

- A. All pipe support and restraining systems shall be installed and secured prior to the testing or activation of the pipeline on which they are installed.
- B. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. Tests shall include cycling the piping system to duplicate operating conditions. If any part of the pipe support system proves to be defective or inadequate, as evidenced by vibration or excessive movement, it shall be repaired or augmented at no additional cost to the City of New York.

-END OF SECTION-

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**Section 15071**  
**VIBRATION CONTROL**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for furnishing and installation of vibration isolators for mechanical equipment, piping and ductwork and all other appurtenances for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15184 - Refrigeration Piping and Specialties
- B. Section 15540 - Fuel Fired Heaters
- C. Section 15670 - Condensing Units
- D. Section 15720 - Air Handling Units
- E. Section 15730 - Packaged Air Conditioning Units
- F. Section 15765 - Terminal Heat Transfer Units
- G. Section 15810 - Ductwork
- H. Section 15830 - Fans

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. ASTM A 36/A36M - Specification for Structural Steel.
  - 2. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Shop Drawings: Submit shop drawings showing structural design and details of vibration isolators, inertia bases, steel beam bases and other custom-fabricated work not covered by the manufacturer's submitted data.
  - 1. Furnish templates to fabricators of equipment bases, foundations and other support systems, as needed for coordination of vibration isolation units with the supported equipment.
  - 2. Submit shop drawings indicating locations of units and flexible connections. Include support isolation points for ductwork including risers and air housings.
  - 3. Include a schedule of the units, showing size or manufacturer's part number, and weight supported and resulting deflection of each unit.



4. Submit catalog data for each type of vibration isolation including materials, dimensions, application and performance characteristics.

## 1.05 QUALITY ASSURANCE

- A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer and as follows:
  1. Except otherwise indicated, obtain vibration isolation units from a single manufacturer.
  2. Engage the manufacturer to provide technical support in selection and supervision of installation of vibration isolation units.
- B. Performance: Comply with the minimum static deflections recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, including definitions of critical and noncritical locations, for selection and application of vibration isolation materials and units as indicated.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Vibration Isolators
  1. Consolidated Kinetics Corp.
  2. Korfund Dynamics Corp.
  3. Mason Industries, Inc.
  4. Vibration Eliminator Co., Inc.
  5. Vibration Mountings and Controls, Inc.
- C. Flexible Duct Connectors
  1. Vent Products Co. Inc.
  2. Ventfabrics Inc.
  3. Holz Rubber Co.

### 2.02 PAD-TYPE ISOLATORS

- A. General: Except as otherwise indicated, provide a manufacturer's standard pad-type isolation unit, one of the following types, color coded to indicate load capacity:
  1. Fiberglass pads or shapes

2. Neoprene pads
  3. Cork/neoprene pads
- B. Fiberglass Pads and Shapes: Use glass fiber of not more than 0.18 mil diameter, produced by multiple-flame attenuation process, molded with the manufacturer's standard fillers and binders through 10 compression cycles at 3 times the rated load bearing capacity, to achieve natural frequency of not more than 12 hertz, in thicknesses and shapes required for use in vibration isolation units.
- C. Neoprene Pads: Use oil-resistant neoprene sheets, of the manufacturer's standard hardness and cross-ribbed pattern, designed for neoprene-in-shear-type vibration isolation, and of the thicknesses required.
- D. Cork/Neoprene Pads: Use a close grained composition cork sheet, laminated between 2 sheets of ribbed, oil-resistant neoprene, in the thicknesses required.

### 2.03 SPRING ISOLATORS

- A. Spring Isolators, Free-Standing: Except as otherwise indicated, provide vibration isolation springs between top and bottom loading plates, and with pad-type isolators bonded to the bottom of the bottom loading plate. Include studs or cups to provide for centering of the springs on the plates. Include leveling bolts with lock nuts and washers, centered in the top plate, arranged for leveling and anchoring the supported equipment. Include holes in the bottom plate for bolting the unit to the substrate.
- B. Vibration Isolation Springs: Use wound-steel compression springs, of high-strength, heat-treated, spring alloy steel, with an outside diameter of not less than 0.8 times the operating height, with a lateral stiffness not less than vertical stiffness, and designed to reach solid height before exceeding the rated fatigue point of the steel.

### 2.04 RAILS

- A. Equipment Rails: Where rails or beams are indicated for use with isolator units to support equipment, provide steel beams complying with ASTM A 36/A36M, with a minimum depth of 6 inches or 0.08 times the span of beam between isolators (whichever is greater). Provide welded brackets at the ends of each beam, and anchor each end to the spring isolator unit. Provide bolt holes in beams matching anchor bolt holes in equipment. Provide beams of the section modulus indicated, or, if not indicated, selected for normal-weight equipment loading to limit static load stress to 16,000 psi. Except as otherwise indicated, position equipment on equipment rails so that the load will be equally supported by the isolator units.

### 2.05 BASES AND FRAMES

- A. Fabricated Equipment Bases: Where supplementary bases are required for use with isolator units to support equipment (base not integral with equipment),

provide welded units, fabricated of structural steel shapes, plates and bars complying with ASTM A 36/A36M, as shown. Provide welded support brackets at points as required and anchor the base to spring isolator units. Except as otherwise indicated, arrange brackets to result in the lowest possible mounting height for the equipment. Provide bolt holes in bases to match mounting anchor bolt holes in the equipment. Fabricate the bases with the depth of the structure not less than 0.10 times the longest span of the base, rigidly braced to support the equipment without deflections or distortions which would be detrimental to the equipment or equipment performance.

## 2.06 HANGERS AND RISERS

- A. Isolation Hangers: Provide hanger units formed with brackets and including the manufacturer's standard compression isolators of the type indicated. Design brackets for 5 times the rated loading of units. Fabricate units to accept misalignment of suspension members, and for use with either rod or strap type members, including acoustical washers to prevent metal-to-metal contacts.
1. Provide a vibration isolation spring with a cap and pad-type isolators, securely retained in the unit.
  2. Provide a neoprene pad, securely retained in the unit.
  3. Provide a fiberglass pad or shape, securely retained in the unit, with a threaded metal top plate.
  4. Install a removable spacer in each unit, to limit the deflection during installation to the rated-load deflection.
- B. Riser Isolators: Provide the manufacturer's standard pad-type isolator bonded to steel plates, formed for welding to the pipe sleeve extension.
- C. Riser Support Isolators: Provide the manufacturer's standard pad-type isolator laminated between 2 formed steel plate members, one for welding to the pipe sleeve extension and other for welding to the pipe riser.

## 2.07 DUCT AND PIPE CONNECTORS

- A. Flexible Duct Connectors: Provide flexible connections made from prefabricated galvanized metal for galvanized ductwork and Type 316 L stainless steel for stainless steel ductwork, and laminated flexible sheets of cotton duct and sheet elastomer, neoprene, reinforced with steel wire mesh where required for strength to withstand the duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as a flexible isolation unit, and of the manufacturer's standard length for each size unless otherwise indicated. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and capable of absorbing vibration of connected equipment. Equip each unit with galvanized steel retaining rings for airtight connections with ductwork. Provide

products approved by NFPA for vibration isolation connectors in duct systems as covered by NFPA Bulletin 90A.

1. Provide U-type configurations, asbestos free of 2 ply, vulcanized EPDM elastomer fabric flexible connectors, with a 6-inch minimum width, and molded flanges and corners. Design the flexible connectors for no less than 2 psi, temperature no greater than 180 degrees F, and to accept the system movements without imposing any significant forces on the ductwork. Provide flexible connectors resistant to acids, alkalis, chlorides and all chemicals and reaction byproducts they are exposed to. Use shop painted retaining bars to back up flanges.
- B. Flexible Pipe Connectors: For ferrous piping, provide stainless steel hose covered with stainless steel wired braid with NPT steel nipples or 150 psi ANSI flanges, welded to the hose.
- C. Rubber Flexible Pipe Connectors: Provide connectors of rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings. Provide connectors with the temperature and pressure ratings to suit the intended service.

### PART 3 EXECUTION

#### 3.01 APPLICATIONS

- A. General: Apply types of vibration isolation materials and units indicated at locations shown or otherwise required. Selection is at the Contractor's option where more than one type is indicated.
- B. Pad-Type Isolators: Install pad type isolators at the following equipment:
  1. Fuel Fired Heaters
  2. Condensing Units
  3. Air Handling Units
  4. Packaged Air Conditioning Units
- C. Equipment Rails or Fabricated Equipment Bases and Spring Isolators: Install equipment rails or fabricated equipment bases and spring isolators where the following floor-mounted equipment is indicated:
  1. Air handling units
  2. Supply and exhaust fans
  3. Condensing Units
  4. Fuel Fired Heaters
  5. Packaged Air Conditioning Units
  6. Air handling units

- D. Isolation Hangers: Install isolation hangers where the following suspended equipment is indicated:
1. Package air conditioner units
  2. Fans
  3. Unit Heaters
  4. Pipe over 1-inch pipe size, located in mechanical equipment rooms, and each run connected to vibration-isolation-mounted equipment for a distance of 100 diameters but not less than 50 feet
  5. Ductwork except flexible ductwork, located in mechanical equipment rooms, and each run connected to vibration-isolation-mounted equipment for a distance of 50 feet
- E. Riser Isolators: Install riser isolators where the following risers pass through floors and roofs; provide support-type where riser support is required:
1. Pipe risers
  2. Pipe risers, within 50 feet 0 inches of a connection with vibration-isolation-mounted equipment for a distance of 50 feet
  3. Pipe risers in critical locations
- F. Flexible Duct Connectors: Install flexible duct connectors at the following ductwork connections:
1. Connections with air handling equipment
  2. Connections with all fans
  3. Building expansion joints
- G. Flexible Pipe Connectors: Install flexible pipe connectors in piping systems at the following locations:
1. Air handling units
  2. Condensing units - refrigerant pipes
  3. Environmental control system indoor units - refrigerant pipes

### 3.02 INSTALLATION

- A. General: Except as otherwise indicated, comply with the manufacturer's instructions for installation and load application to vibration isolation materials and units. Make adjustment so that the units do not exceed the rated operating deflections or bottom out under loading, and are not short-circuited by other

contacts or bearing points. Remove space blocks and similar devices intended for temporary protection against overloading during installation.

- B. Anchor and attach units to substrate and equipment as required for a secure operation and to prevent displacement by normal forces, and as indicated.
- C. Adjust leveling devices as required to distribute loads uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly.
- D. Locate isolation hangers as near overhead support structure as possible.
- E. Weld riser isolator units in place as required to prevent displacement from loading and operations.
- F. Bond flanges of flexible duct connectors to ducts and housings to provide airtight connections. Seal seams and penetrations to prevent air leakage.
- G. Install flexible pipe connectors on the equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.

### 3.03 EXAMINATION OF RELATED WORK

- A. Coordination: Examine the installation of equipment, piping, ducts and conduits related to vibration isolation, including items connected to vibration isolators and after completion of other related work before equipment startup, furnish a written report of the inspection and correct any observed inadequacies for proper operation and performance of the vibration isolators. Have the report cover, but not necessarily be limited to the following:
  - 1. Equipment installations on vibration isolators
  - 2. Piping connections including flexible connections
  - 3. Ductwork connections including provisions for flexible connections
  - 4. Passage of piping and ductwork which is to be isolated through walls and floors
- B. Equipment Start-Up: Do not start-up equipment until inadequacies have been corrected in an acceptable manner.

3.04 DEFLECTION MEASUREMENTS

- A. Measurement Report: Upon completion of the vibration isolation Work, prepare a report showing measured equipment deflections for each major item of equipment as indicated.

1. Air handlings
2. Fans
3. Air cooled condensers

-END OF SECTION-

**Section 15076**  
**PIPING AND EQUIPMENT IDENTIFICATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish and install all components of the system for identification of piping and equipment. The system includes the placing of identification signs and direction-of-flow arrows on all visible plant piping, the placing of nameplates on plant equipment and structures, and painting in color of all equipment and pipe, except stainless steel or aluminum surfaces, as shown on the Contractor's working drawings submitted under the related Specifications sections for equipment, piping and valves, and shown on the Contract Drawings, and as required for a complete job.

**1.02 RELATED SPECIFICATION**

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting

**1.03 SUBMITTALS**

- A. Product Data: For identification materials and devices.
- B. Samples: Of color, lettering style, and graphic representation required for each identification material and device.
- C. Valve Schedules: For each piping system. Reproduce on standard-size bond paper. Tabulate valve number, piping system, system abbreviation as shown on tag, room or space location of valve, and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Besides mounted copies, furnish copies for maintenance manuals specified in Division 1.

**1.04 REFERENCES**

- A. ASTM D523 - Standard Test Method for Specular Gloss
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- D. ASTM D646 - Standard Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)



- E. ASTM D709 - Standard Specification for Laminated Thermosetting Materials
- F. ASTM D790 - Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
- G. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- H. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

#### 1.05 QUALITY ASSURANCE

- A. Comply with ASME A13.1, "Scheme for the Identification of Piping Systems" for lettering size, length of color field, colors, and viewing angles of identification devices. Follow color facility standard, if exist.

#### 1.06 SEQUENCING AND SCHEDULING

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.

#### 1.07 MANUFACTURER'S GUARANTEE

- A. Provide the specified items from firms regularly engaged in the manufacture of identification devices of types and sizes required, with at least three (3) years of experience in manufacturing signs. In addition, the manufacturer shall guarantee the sign, in writing, against color fading, chipping, corroding or any other manufacturing defects for a period of ten (10) years.

#### 1.08 SPARE PARTS AND ACCESSORIES

- A. Furnish the following spare parts and accessories:
  - 1. For every 20 pipe identification signs installed:
    - a. One pair stainless steel mounting screws
    - b. One pair stainless steel threaded brackets

- c. One pair fiber or plastic washers
  - d. One pair stainless steel banding seals
- 2. One set banding tools and banding accessories
- 3. One stainless steel banding strap, approximately 1000 ft.
- 4. One complete nameplate mounting assembly for every 20 nameplates installed
- 5. One stainless steel cable and splice for every 20 valve identification tags
- B. Provide all spare parts and accessories suitably boxed and marked for storage and reordering.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Construct fiberglass reinforced plastic identification signs and nameplates of 70 mils thick fiberglass reinforced plastic conforming to ASTM D709.
- B. Provide fiberglass reinforced plastic process with a blemish free, low gloss surface of superior permanence and durability in the colors selected. Provide each identification sign and nameplate in two colors and with the legend specified. Provide the backside of the sign in black or some other uniform color.
- C. Provide lettering made by silk screening or other permanent embedment of subsurface printed graphics in the material so as to produce a clear, legible sign. Do not place lettering, symbols or markings containing the name of the manufacturer on the signs. The contract number and the year of the contract as given on the Contract Drawings may be placed in small lettering on the front of the sign, if approved by the Commissioner.
- D. Provide signs for piping and valve identification with two 3/8-inch diameter grommet-protected holes located on the long side centerline, the center of the hole to be 1/2 inch from the edge. Provide nameplates for equipment and structures with four 3/8-inch diameter grommet-protected holes, the center of the hole located 1/2 inch away from the edges. Provide all holes with suitable brass or stainless steel grommets.
- E. Construct all signs and nameplates in conformity with ASTM D523, D638, D646, D790, D792 and D5420.

**2.02 DIMENSIONS OF SIGNS AND TAGS**

- A. Provide identification signs and nameplates rectangular in shape and of the dimensions specified below. A dimensioned tolerance of plus or minus 1/16 inch is permissible.

<b>TYPE OF SIGN</b>	<b>Sign Dimensions (Width x Length)</b>
<b>PIPE IDENTIFICATION -</b> 1. Outside diameter of pipe (including pipe insulation): a. 4 inches and larger b. less than 4 inches	  3-1/2 x 12 inches 1-1/2 x 7 inches
<b>VALVE IDENTIFICATION -</b> 1. Valve tags	2 inches diameter
<b>NAMEPLATES -</b> 1. Equipment and structures	3-1/2 x 12 inches

**2.03 LETTERING OF SIGNS**

- A. Perform all lettering and numbering on identification signs and nameplates in block style in size and spacing to suit the size of sign, as approved.
- B. Unless otherwise approved, limit the legend on pipe identification signs to one line and to a total of 12 letters and spaces, and the legend on equipment nameplates to two lines and a maximum of 35 letters and spaces.
- C. Submit samples of the lettering to be used for fiberglass reinforced plastic signs to the Commissioner for approval before manufacturing begins. Such samples must show the height, width and spacing of letters and numbers for any three (3) legends of ten or more letters and spaces.

**2.04 CHEMICAL RESISTANCE**

- A. Provide fiberglass reinforced plastic signs resistant to abrasion, impact, corrosion, and the following acids, alkalis, salts and solvents in accordance with ASTM D543:
1. 10% citric acid
  2. 5% acetic acid
  3. 3-30% sulfuric acid
  4. 10% ammonium hydroxide
  5. 10% sodium chloride
  6. turpentine

7. mineral spirits
8. heptane
9. kerosene
10. ethyl alcohol
11. ethyl acetate
12. transformer oil
13. heavy duty detergents
14. water

- B. Submit certification on acid resistance prior to installation.

## 2.05 COLORS

- A. Code pipeline signs and equipment nameplates and finish coats of paint for pipelines and equipment in basic colors.
- B. Provide brilliant colors, distinctive shades matching as closely as possible (without custom color blending) the following basic colors as specified by the Munsell Color System (MN):

Table Of Standard Colors	
Color	Munsell Number
White	MN - N8.8/
Yellow	MN - 4Y7.5/12.8
Orange	MN - 0.5 YR 4.6/12.2
Red	MN - 7R 3.6/12.7
Brown	MN - 2.5 YR 4.2/4.3
Gray	MN - 2.5PB 5.8/1.7
*Charcoal	MN - 6B 5/0.4
Black	MN - N1/
Blue	MN - 3PB 3.3/7.4
Green	MN - 8G 4.4/6.2
* Provide color "Charcoal" for paints equivalent to MN - N 3.75.	

- C. Provide identification signs for pipelines of all sizes, mechanical equipment and valves in the color combinations specified below under "General Color Code".

General Color Code		
Service Line	Colors	
	Letters	Background
1. MOTOR OIL	Orange	White
2. HYDRAULIC OIL	Red	White
3. LIQUIDS WEAK IN SOLIDS a. Sewage/Bilge Water	Black	Gray
4. NON-POTABLE WATER a. Service Water	Yellow	Blue
5. CITY WATER	White	Blue
6. COMPRESSED AIR	White	Green

- D. Provide vents and drains of the same color combination as the contents of tanks and equipment vented and drained.

## 2.06 LEGEND FOR PIPE IDENTIFICATION SIGNS

- A. Provide identification signs with the following words or abbreviations in color combinations shown to identify the pipe line service:

Pipe Identification Signs			
LEGEND	Service	Color Code	
		Lettering	Background
COMP. AIR	Compressed air	White	Green
DIESEL FUEL	Diesel fuel oil	Orange	White
DRAIN - *	Drain - *	*	*
MOTOR OIL	Motor oil	Orange	White
M.O. FILL	Motor oil fill	Orange	White
HYDRAULIC OIL	Hydraulic fluid	Red	White
H.O. FILL	Hydraulic oil Fill	Black	White
W.O. EXTRACTION	Waste Oil Extraction	Black	White
SERVICE WATER	Service water	Yellow	Gray
SEWAGE	Sewage	Black	Gray
SPRAY WATER (Dust Suppression)	Spray water	Yellow	Gray
SPRAY WATER (Odor Control)			
VENT - *	Vent - *	*	*

Pipe Identification Signs			
LEGEND	Service	Color Code	
		Lettering	Background
W.O. DRAIN	Waste Oil Drain	Black	White
WATER	City water	White	Blue
* Where shown, specified or required, the legend for drain, vent and similar lines shall also include the equipment, structure or identification number to which the service applies.			

- B. Number valves in conformity with the Basic Code as specified by the Operation and Maintenance Manual for the plant. Perform color combinations for such lines and valves in the same color combinations as the medium serviced and as given in the "General Color Code".
- C. In addition to the identification requirements listed above, for all gas piping at pressures above ½ psig, show the maximum pressure level within the piping as required by Local Law 30.

## 2.07 VALVE IDENTIFICATION TAGS

- A. Furnish and attach valve identification tags on all valves and controls.
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.
1. Material: 0.032-inch- thick, polished brass.
  2. Size: 1-1/2-inches diameter, unless otherwise indicated.
  3. Shape: As indicated for each piping system.
- C. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.
- D. Valve Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include screws.
1. Frame: Extruded aluminum.
  2. Glazing: ASTM C 1036, Type I, Class 1, Glazing quality B, 2.5-mm, single-thickness glass.
- E. Valve Tag Application Schedule: Tag valves according to size, shape, color scheme, and with captions similar to those indicated in the following:
- F. Tag Material: Brass.
- G. Tag Size and Shape: According to the following:

1. Water: 2 inches, round.

H. Tag Color: Natural

I. Letter Color: Black

## 2.08 ARROWS

A. Lettering: Manufacturer's standard preprinted captions as selected by Commissioner.

1. Arrows: Either integrally with piping system service lettering, to accommodate both directions, or as separate unit, on each pipe marker to indicate direction of flow.

## 2.09 NAMEPLATES

A. Provide nameplates for equipment and structures in the same color combination as the medium they service. Legends for nameplates must follow the terminology shown. Provide numbering system as described in the Operation and Maintenance Manual.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.

2. Location: Accessible and visible.

C. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

D. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least 3 times letter height and of length required for label.

F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
  2. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
  3. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- G. Plastic Equipment Markers: Follow facility standards, if not existing follow as below - Manufacturer's standard laminated plastic, in the following color codes:
1. Yellow: Heating equipment and components.
  2. Blue: Equipment and components that do not meet criteria above.
  3. Hazardous Equipment, if any: Use colors and designs recommended by ASME A13.1.
  4. Terminology: Match schedules as closely as possible. Include the following:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
  5. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- H. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.
1. Size: 3-1/4 by 5-5/8 inches.
  2. Fasteners: Brass grommets and wire.
  3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
- I. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.



1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.
- J. The following is a representative list, not necessarily complete, of nameplate legends with appropriate color combinations to which the equipment identification number must be added:

NAMEPLATES			
Legend		Color Code	
First Line <sup>(1)</sup>	Second Line <sup>(2)</sup>	Lettering	Background
AIR COMPRESSOR	**	White	Green
AUXILIARY ELECTRIC	GENERATOR **	Red	Green
W.O. EXTRACTION	OIL PUMP **	Black	White
MOTOR OIL	DISPENSER	Black	White
HYDRAULIC OIL	DISPENSER	Black	White
WASTE OIL	SUMP	Black	White
HYDRO-PNEUMATIC	TANK **	White	Blue
HYDRAULIC OIL STORAGE	TANK	Black	White
HYDRAULIC OIL TRANSFER	PUMP **	Black	White
MOTOR OIL STORAGE	TANK **	Black	White
MOTOR OIL TRANSFER	PUMP **	Black	White
COMPRESSED AIR	COMPRESSOR **	White	Green
COMPRESSED AIR	RECEIVER **	White	Green
SPRAY WATER (Dust Suppression)	PUMP **	Yellow	Gray
SPRAY WATER (Odor Control)			
EMERGENCY GENERATOR	**	Red	Green
WASTE OIL	EXTRACTION PUMP	Black	White
WASTE OIL STORAGE	TANK **	Black	White
<sup>(1)</sup> Nominal limit of 18 letters, numerals and spaces. <sup>(2)</sup> Nominal limit of 17 letters, numerals and spaces. *Where equipment is mounted on roofs or where exposed to the public view, such as in office areas, the color will be selected by the Commissioner.  **The legend on these nameplates also includes the appropriate numeral and letter designation for such equipment and structures as specified by the Operation and Maintenance Manual.			

## 2.10 ADDITIONAL SIGNS AND NAMEPLATES

- A. In addition to the legends specified above, the Commissioner may order the Contractor to furnish and install additional identification signs, arrows and nameplates at no additional cost to the City of New York. Such additional signs may be requested near completion of the work and will be limited to no more than five (5) signs for each of the five types specified in Article 2.02. Conform legends and color combinations for additional signs to the requirements specified.

## 2.11 COLOR OF PIPELINES

- A. Paint all pipelines and equipment in conformity with the requirements of Sections 09911- Exterior Painting and 09912 - Interior Painting, as applicable. Color code the color of the final coats of paint. Paint each piping system a different color as selected and approved.
- B. Do not paint aluminum or stainless steel ductwork or jackets on insulated pipelines. Should the specifications state that flanges, flexible couplings, valves and fittings for such jacketed lines not be covered, paint only the flanges, flexible couplings, valves and fittings.

## PART 3 EXECUTION

### 3.01 LABELING AND IDENTIFYING PIPING SYSTEMS

- A. Install pipe markers on each system. Include arrows showing normal direction of flow.
- B. Marker Type: Plastic markers, with application systems. Install on pipe insulation segment where required for hot, noninsulated pipes. Stenciled markers are not acceptable.
- C. Fasten markers on pipes and insulated pipes smaller than 6 inches OD by one of following methods:
  - 1. Snap-on application of pretensioned, semirigid plastic pipe marker.
  - 2. Adhesive lap joint in pipe marker overlap.
  - 3. Laminated or bonded application of pipe marker to pipe or insulation.
- D. Fasten markers on pipes and insulated pipes 6 inches in diameter and larger by one of following methods:
  - 1. Laminated or bonded application of pipe marker to pipe or insulation.
  - 2. Strapped to pipe or insulation with manufacturer's standard stainless-steel bands.

- E. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations according to the following:
1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
  3. Near penetrations through walls, floors, ceilings, or non-accessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

### 3.02 LOCATION

- A. Locate identification signs for piping along straight line runs at intervals of not more than 30 feet, near valves, branches and junction points and where pipes pass through walls or ceilings. Place direction-of-flow arrows as shown or required. Locate signs on large valves on or adjacent to the valve itself. Place all piping identification signs so as to be easily visible from operating locations. Locate nameplates on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures so as to prevent damage to the nameplate.

### 3.03 VALVE TAGS

- A. Install on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in valve schedule.
- B. Install mounted valve schedule in each major equipment room.

### 3.04 MOUNTING

- A. Mount identification signs and arrows on piping parallel and tangent to the pipe and valves by fastening with screws, plastic or fiber washers, threaded brackets and banding straps and seals. Provide screws and brackets of stainless steel with 5/16 -

18 American Standard Coarse Threads; provide No. 25 U.S. gauge stainless steel, 3/4 inch wide bands.

- B. Where pipe is insulated, use care in mounting the signs so to prevent the banding straps from crushing the insulation.
- C. Provide mounting assembly "Steelbinder" strapping unit as manufactured by A.J. Gerrard & Co., Des Plaines, Illinois, Independent Metal Strap Co., Inc., Roslyn, N.Y. or approved equal.
- D. Mount nameplates in a manner specifically approved by the Commissioner after the installation of equipment or construction of structures. Submit details of the method of fastening to the Commissioner for approval. Provide fastening devices for nameplates and valves of stainless steel construction.
- E. Mount valve identification signs with approved stainless steel brackets or approved stainless steel strapping in such a fashion that sharp corners or edges on signs, brackets, bolts, chain or strapping will not constitute a hazard to personnel operating the valves. Since it is impractical to detail each means of attachment in the Detailed Specifications or on the Contract Drawings, each means of attachment will receive approval only on its own merits. Submit for approval sketches of each type proposed.
- F. Do not attach identification tags or signs to handwheels. Use of flange bolts or bonnet bolts as a means of attachment of brackets will receive consideration. Provide all attachment devices and bolting of Type 304 stainless steel.

### 3.05 EQUIPMENT SIGNS AND MARKERS

- A. Install engraved plastic-laminate signs or equipment markers on or near each major item of mechanical equipment. Include signs for the following general categories of equipment:
  - 1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
  - 2. Meters, gages, thermometers, and similar units.
  - 3. Pumps and similar motor-driven units.
  - 4. Water Heater and similar equipment.
  - 5. Tanks and pressure vessels.
  - 6. Strainers, filters, and similar equipment.

3.06 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.
- B. Clean faces of identification devices and glass frames of valve charts.

-END OF SECTION-

**Section 15081**  
**PIPING INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

**1.02 RELATED SPECIFICATIONS**

- A. Section 07842 - Fire-Resistive Joint System, for firestopping materials and requirements for penetrations through fire and smoke barriers.
- B. Section 15820 - Duct Insulation, for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
- C. Section 15060 - Hangers and Supports, for pipe insulation shields and protection saddles.
- D. Section 15076 - Piping And Equipment Identifications
- E. Section 15771 - Electric Heat Tracing Systems

**1.03 SUBMITTALS**

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for the following:
  - 1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
  - 2. Attachment and covering of heat trace inside insulation.
  - 3. Insulation application at pipe expansion joints for each type of insulation.
  - 4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 5. Application of field-applied jackets.
- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compli-

ance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

- D. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

#### 1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 15060 - Hangers and Supports.
- B. Coordinate clearance requirements with piping Installer for insulation application.
- C. Coordinate installation and testing of steam or electric heat tracing.

#### 1.07 SCHEDULING

- A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. Cellular-Glass Insulation
    - a. Pittsburgh-Corning Corp.
    - b. Or approved equal

**2.02 INSULATION MATERIALS**

- A. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
  - 1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
  - 2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.
- B. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

**2.03 METAL JACKETS**

- A. Stainless Steel Jackets: ASTM A 167 or ASTM A 240/A 240M; Type 304, minimum thickness of 33 gage (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 0.5 inch.
- B. Factory-Fabricated Fitting Covers
  - 1. Same material, finish, and thickness as jacket.
  - 2. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
  - 3. Tee covers
  - 4. Flange and union covers
  - 5. End caps
  - 6. Beveled collars



- 7. Valve covers
- 8. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

#### 2.04 ACCESSORIES AND ATTACHMENTS

- A. Stainless Steel Bands: 3/4 inch wide x 0.007 inch thick, materials compatible with jacket.
- B. Coating and vapor barrier treatment shall be less than 0.02 perms, and shall be Benjamin Foster 30-35, MEI 55-10, Childers CP-30 (indoors), Childers Encacel 5 (outdoor)
- C. Vapor barrier sealant and flashing compound shall be equal to Benjamin Foster No. 30-45, MEI 44-05, Childers CP-70 or CP-76.

#### 2.05 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

#### 2.06 BELOW PIER PIPING

- A. Asphalt Bonded: All of the under pier pipe insulation shall be installed with single or multiple layers of Cellular-Glass insulation fabricated with hot asphalt and covered with stainless steel jackets per manufactures recommendations.
- B. All of the under pier pipe insulation shall be a water tight installation.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 SURFACE PREPARATION

- A. Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

### 3.03 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
  - 1. Apply insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- O. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth
  2. Circumferential Joints: Cover with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
  3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
  4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
  5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- P. Exterior Wall Penetrations: For penetrations of exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Section 07842 - Fire-Resistive Joint Materials of the Structures and Equipment Contract.

S. Floor Penetrations: Apply insulation continuously through floor assembly.

1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

### 3.04 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with metal jacking.
4. Cover fittings metal jacking. Overlap metal jacking on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard metal jacking fittings covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. Use preformed metal jacking fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

### 3.05 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  1. Flexible connectors
  2. Vibration-control devices
  3. Fire-suppression piping
  4. Drainage piping located in crawl spaces, unless otherwise indicated
  5. Below-grade piping, unless otherwise indicated
  6. Chrome-plated pipes and fittings, unless potential for personnel injury

## 3.06 FIELD QUALITY CONTROL

- A. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
  - 1. Inspect fittings and valves randomly selected by Engineer.
  - 2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
  - 3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.
- B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

## 3.07 INSULATION APPLICATION SCHEDULE, GENERAL

- A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.
- B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

## 3.08 INSULATION APPLICATION SCHEDULE

- A. Indoor Services: Domestic Hot and recirculated Hot Water, Domestic Cold Water, & Service water
  - 1. Operating Temperature: 60 to 140 deg F
  - 2. Insulation Material: Cellular Glass
  - 3. Vapor Retarder: Yes
  - 4. Jacket: Aluminum/Stainless Steel
  - 5. Insulation shall be Mineral-Fiber, Preformed Pipe Insulation, Type I
    - a. Pipe size -  $\frac{3}{4}$  inch to 1  $\frac{1}{2}$  inch, insulation - 1 inch thick
    - b. Pipe size - 2 inch to 2  $\frac{1}{2}$  inch, insulation - 1  $\frac{1}{2}$  inch thick
    - c. Pipe size - 3 inch to 4 inch, insulation - 2 inch thick
- B. Indoor Service: Storm Drainage Piping
  - 1. Operating Temperature: 60 to 140 deg F
  - 2. Insulation Material: Cellular glass

3. Vapor Retarder: yes
4. Jacket: Aluminum/Stainless Steel
5. Insulation shall be Mineral-Fiber, Preformed Pipe Insulation, Type I
  - a. Pipe size - 2 inch to 2 ½ inch, insulation -1 1/2 inch thick
  - b. Pipe size - 3 inch to 15 inch, insulation - 2 inch thick

C. Outdoor Service: Sanitary Waste

1. Operating Temperature: 45 to 60 deg. F
2. Insulation Material: Cellular glass
3. Vapor Retarder: Yes
4. Jacket: Stainless Steel
5. Insulation shall be Mineral-Fiber, Preformed Pipe Insulation, Type I
  - a. Pipe size - 1 ½ inch, insulation -1 inch thick
  - b. Pipe size - 2 inch to 2 ½ inch, insulation - 1 ½ inch thick
  - c. Pipe size - 3 inch to 8 inch, insulation - 2 inch thick

D. Outdoor Service: Under Pier Storm Drainage Piping

1. Operating Temperature: 45 to 60 deg F
2. Insulation Material: Cellular glass
3. Vapor Retarder: yes
4. Water Tight installation: yes
5. Jacket: Stainless Steel
6. Insulation shall be Mineral-Fiber, Preformed Pipe Insulation, Type I
  - a. Pipe size - 2 inch to 2 ½ inch, insulation -1 1/2 inch thick
  - b. Pipe size - 3 inch to 15 inch, insulation - 2 inch thick

-END OF SECTION-

**Section 15110**  
**PLUMBING VALVES**

**PART 1 GENERAL****1.01 SUMMARY**

A. This Section includes the following general-duty valves:

1. Bronze angle valves
2. Copper-alloy ball valves
3. Bronze check valves
4. Gray-iron swing check valves
5. Bronze gate valves
6. Cast-iron gate valves
7. Bronze globe valves
8. Cast-iron globe valves

**1.02 RELATED SPECIFICATIONS**

- A. Section 13915 - Fire-Suppression Piping and Section 13921 - Electric Drive, Centrifugal Fire Pumps, for fire-protection valves.
- B. Section 15076 - Piping and Equipment Identification
- C. Section 15430 - Plumbing Specialties

**1.03 DEFINITIONS**

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure
2. EPDM: Ethylene-propylene-diene terpolymer rubber
3. NBR: Acrylonitrile-butadiene rubber
4. PTFE: Polytetrafluoroethylene plastic
5. SWP: Steam working pressure
6. TFE: Tetrafluoroethylene plastic

**1.04 SUBMITTALS**

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.



## 1.05 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water, sanitary waste, storm drainage piping valves & industrial waste unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 PRODUCTS

### 2.01 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

## F. Valve Actuators

1. Handwheel: For valves other than quarter-turn types
2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench or every 10 plug valves, for each size square plug head.

## G. Extended Valve Stems: On insulated valves.

## H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

## I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.
  - a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
2. Threaded: With threads according to ASME B1.20.1.

## J. Valve Bypass and Drain Connections: MSS SP-45.

## 2.02 BRONZE ANGLE VALVES

## A. Manufacturers

1. Type 1, Bronze Angle Valves with Metal Disc:
  - a. Cincinnati Valve Co.
  - b. Crane Co.; Crane Valve Group; Stockham Div.
  - c. Hammond Valve
  - d. Milwaukee Valve Company
  - e. NIBCO INC.
  - f. Red-White Valve Corp.
  - g. Or approved equal

## B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.

## C. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.

**2.03 COPPER-ALLOY BALL VALVES****A. Manufacturers****1. Two-Piece, Copper-Alloy Ball Valves:**

- a. Conbraco Industries, Inc.; Apollo Div.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Jamesbury, Inc.
- h. Milwaukee Valve Company
- i. NIBCO INC.
- j. R & M Energy Systems (Borger, TX)
- k. Red-White Valve Corp.
- l. Watts Industries, Inc.; Water Products Div.
- m. Or approved equal

**2. Three-Piece, Copper-Alloy Ball Valves**

- a. Conbraco Industries, Inc.; Apollo Div.
- b. Grinnell Corporation
- c. Hammond Valve
- d. Jamesbury, Inc.
- e. NIBCO INC.
- f. Red-White Valve Corp.
- g. Worcester Controls
- h. Or approved equal

**B. Copper-Alloy Ball Valves, General: MSS SP-110.****C. Two-Piece, Copper-Alloy Ball Valves: bronze, Bronze body with full port, chrome-plated ball; TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.****D. Three-Piece, Copper-Alloy Ball Valves: or bronze, Bronze body with full port, chrome-plated bronze ball; TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.****2.04 BRONZE CHECK VALVES****A. Manufacturers****1. Type 3, Bronze, Swing Check Valves with Metal Disc:**

- a. American Valve, Inc.
- b. Crane Co.; Crane Valve Group; Crane Valves

- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. NIBCO INC.
- i. Powell, Wm. Co.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Watts Industries, Inc.; Water Products Div.
- m. Or approved equal

2. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. McWane, Inc.; Kennedy Valve Div.
- h. Milwaukee Valve Company
- i. NIBCO INC.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Watts Industries, Inc.; Water Products Div.
- m. Or approved equal

B. Bronze Check Valves, General: MSS SP-80.

C. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

D. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

E. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.05 GRAY-IRON SWING CHECK VALVES

A. Manufacturers

1. Type I, Gray-Iron Swing Check Valves with Metal Seats

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.

- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. Mueller Co.
- i. NIBCO INC.
- j. Powell, Wm. Co.
- k. Red-White Valve Corp.
- l. Walworth Co.
- m. Or approved equal

B. Gray-Iron Swing Check Valves, General: MSS SP-71.

C. Type I, Class 125, gray-iron, swing check valves with metal seats.

D. Type II, Class 125, gray-iron, swing check valves with composition to metal seats.

## 2.06 BRONZE GATE VALVES

### A. Manufacturers

#### 1. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves

- a. American Valve, Inc.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. NIBCO INC.
- i. Powell, Wm. Co.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Or approved equal

#### 2. Type 3, Bronze, Rising-Stem, Split-Wedge Gate Valves:

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Jenkins Valves
- c. Grinnell Corporation
- d. NIBCO Inc.
- e. Or approved equal

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

## 2.07 CAST-IRON GATE VALVES

## A. Manufacturers

## 1. Type I, Cast-Iron, Rising-Stem Gate Valves

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. NIBCO INC.
- i. Powell, Wm. Co.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Watts Industries, Inc.; Water Products Div.
- m. Or approved equal

## B. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

## C. Class 125, OS&amp;Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

## 2.08 BRONZE GLOBE VALVES

## A. Manufacturers

## 1. Type 1, Bronze Globe Valves with Metal Disc

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves
- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. NIBCO INC.
- i. Powell, Wm. Co.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Or approved equal

## 2. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves
- c. Crane Co.; Crane Valve Group; Jenkins Valves

- d. Crane Co.; Crane Valve Group; Stockham Div.
- e. Grinnell Corporation
- f. Hammond Valve
- g. Milwaukee Valve Company
- h. NIBCO INC.
- i. Walworth Co.
- j. Or approved equal

- B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- C. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- D. Type 3, Class 125, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

## 2.09 CHAINWHEEL ACTUATORS

### A. Manufacturers

- 1. Babbitt Steam Specialty Co.
- 2. Roto Hammer Industries, Inc.
- 3. Or approved equal

### B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

- 1. Sprocket Rim with Chain Guides: Ductile iron of type and size required for valve.
- 2. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
- 3. Chain: Hot-dip, galvanized steel of size required to fit sprocket rim.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

### 3.02 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball or gate valve
  - 2. Throttling Service: Ball or globe valves
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
  - 1. Ball Valves, NPS 2 and Smaller: Three-piece, 400-psig-psig CWP rating, copper alloy
  - 2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy
  - 3. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125, horizontal or vertical, bronze
  - 4. Swing Check Valves, NPS 2 and Smaller: Type 1, Class 150, bronze
  - 5. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron
  - 6. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type I, Class 150
  - 7. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type I, Class 125, cast iron
  - 8. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze
  - 9. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, rising stem, OS&Y, bronze-mounted cast iron
  - 10. Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze
  - 11. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted cast iron



- D. Sanitary Waste, Storm Drainage and industrial waste Piping: Use the following types of valves:
1. Swing Check Valves, NPS 2 and Smaller: Type 3, Class 150, bronze
  2. Swing Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 125, gray iron
  3. Gate Valves, NPS 2 and Smaller: Type, Class 125, bronze
  4. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, cast iron OS&Y, bronze-mounted cast iron
  5. Globe Valves, NPS 2 and Smaller: Type 1, Class 150, bronze
  6. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, cast iron
- E. Select valves, except wafer and flangeless types, with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends
  2. For Copper Tubing, NPS 2-1/2 to NPS 6: Flanged ends
  3. For Steel Piping, NPS 2 and Smaller: Threaded ends
  4. For Steel Piping, NPS 2-1/2 to NPS 6: Flanged ends

### 3.03 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheel operators on valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor elevation.
- G. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.
  2. Lift Check Valves: With stem upright and plumb.

3.04 JOINT CONSTRUCTION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.05 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15111**  
**VALVES 4-INCH AND LARGER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install 4 inch and larger valves and appurtenances complete and operational.
- B. Valves for gas and air have been specifically identified. All other valves are for liquid service.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting
- C. Section 15076 - Piping and Equipment Identification
- D. Section 15112 - Valves Smaller than 4 Inches
- E. Section 16220 - Electric Motors

**1.03 REFERENCES**

- A. American National Standards Institute (ANSI) specifications
  - 1. B16.1, Cast-Iron Pipe Flanges and Flanged Fittings
  - 2. B16.34, Valves-Flanged, Threaded, and Welded End
- B. API Standards
  - 1. 594, Wafer Check Valves
  - 2. 598, Valve Inspection and Test
  - 3. 609, Butterfly Valves, Lug-Type and Wafer-Type
- C. American Society for Testing and Materials (ASTM) Specifications
  - 1. A126, Gray Iron Castings for Valves, Flanges and Pipe Fittings
  - 2. A193, Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
  - 3. A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
  - 4. A240, Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

5. A276, Stainless Steel Bars and Shapes
  6. A307, Carbon Steel Externally Threaded Standard Fasteners
  7. A380, Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems
  8. A536, Ductile Iron Castings
  9. A743, Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
  10. B21, Naval Brass, Rod, Bar, and Shapes
  11. B61, Steam or Valve Bronze Castings
  12. B62, Composition Bronze or Ounce Metal Castings
  13. B98, Copper-Silicon Alloy Rod, Bar, and Shapes
  14. B124, Copper and Copper Alloy Forging Rod, Bar and Shapes
  15. B138, Manganese Bronze Rod, Bar and Shapes
  16. B584, Copper Alloy Sand Castings for General Applications
  17. B429, Test Methods for Rubber Property - Adhesion to Rigid Substrates
  18. D1785, Poly (Vinyl chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D. American Water Works Association (AWWA) Specifications
1. C500, Metal-Seated Gate Valves for Water Supply Service
  2. C501, Cast-Iron Sluice Gates
  3. C504, Rubber-Seated Butterfly Valves
  4. C507, Ball Valves, 6 In. Through 48 In.
  5. C508, Swing-Check Valves for Waterworks Service, 2 In. Through 24 In.
  6. C509, Resilient-Seated Gate Valves for Water Supply Service
  7. C540, Power-Actuating Devices for Valve and Sluice Gates
  8. C550, Protective Epoxy Interior Coatings for Valves and Hydrants
- E. Federal Specifications
1. TT-C-494B, Coating Compound-Bituminous Solvent Type, Acid Resistant

## 1.04 GENERAL REQUIREMENTS

- A. Manually operated valves, with or without extension stems, shall require not more than a 40-pound pull on the manual operator to open or close a valve against the specified criteria. The gear actuator and the valve components shall be able to withstand a minimum pull of 200 pounds on the manual operator and an input torque of 300 foot pounds to an actuator nut. Manual operators include handwheel, chain, crank, lever and a T-handle wrench.
- B. All valves shall turn clockwise to close, unless otherwise specified.
- C. All valves shall have permanent markings for direction to open.
- D. Exposed valves shall have flanged ends conforming to ANSI B16.1, Class 125, for Class 150 valves; and Class 250 and Class 300 flanges for Class 250 valves, unless otherwise shown or specified.
- E. Buried valves shall be provided with mechanical or push-on joints, restrained or unrestrained, similar to the piping.
- F. All materials of construction of the valves shall be confirmed suitable for the application by the valve manufacturer.
- G. Wetted parts shall be protected from galvanic corrosion due to contact of two different metals.
- H. All valves shall have manufacturer's name and rated pressure cast in raised letters on the valve body.
- I. All 4-inch and larger valves shall be provided with brass or Type 316 stainless steel nameplates attached with Type 316 stainless steel screws. The nameplates shall have engraved letters and shall include the following information as a minimum:
  - 1. Valve size
  - 2. Pressure and temperature ratings
  - 3. Date of manufacture
  - 4. Manufacturer's name and address
- J. The valves shall be provided with identification conforming to the requirements of Section 15076 - Piping and Equipment Identification.
- K. Fabricated stainless steel items shall be cleaned and descaled in accordance with ASTM A 380, and shall be as follows:
  - 1. All stainless steel welded fabricated items shall be passivated after manufacture by immersion in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid. Temperature and detention time shall be sufficient

for removal of oxidation and ferrous contamination without etching of surface. Perform a complete neutralizing operation by immersion in a trisodium phosphate rinse followed by clean water wash.

2. The welds shall be scrubbed with the same pickling solution or pickling paste and stainless steel wire brushes after fabrication to remove weld discoloration, and then shall be neutralized and washed clean.
- L. For all stainless steel bolting, anti-seize compound, graphite free, shall be used to prevent galling. Strength of bolting shall not be affected by anti-seize compound.
- M. All valves shall be suitable for operation at the higher operating pressures without leakage.
- N. Electric actuators for electrically actuated valves shall be furnished by the valve manufacturers.
- O. Where shown on the Contract Drawings and/or specified, the manually operated valves shall be provided with limit switches as specified under Article 2.12.

#### 1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 - Shop Drawings.
- B. Working Drawings
  1. Product data sheets for make and model
  2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction
  3. Certificates of compliance with AWWA Standards where applicable
  4. Manufacturer's qualifications
  5. Confirmation of suitability of the valve materials for the application
  6. Power and control wiring diagrams, including terminals and numbers
  7. Complete nameplate data of electric actuators
  8. Spare parts list
  9. Special tools list

## C. Calculations

1. Sizing of electric actuators
2. Sizing of operating mechanisms with extension stems
3. Sizing of gear actuators
4. Sizing of anchor bolts

## D. Certified copies of shop test results and inspection data.

## E. Operation and Maintenance Data: Submit complete manuals including:

1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

## F. Samples: One foot of chain for chainwheel operated valves.

## G. Material test reports representing all major components of valves and operators shall be submitted. All such components shall be traceable to the original heat and/or lot numbers unless otherwise approved.

## 1.06 SPARE PARTS

## A. The following spare parts shall comprise a "spare parts set" for the valve type listed:

## 1. Gate Valves

- a. One set of gaskets
- b. One set of glands
- c. One set of bushings

## 2. Butterfly Valves

- a. One set of bearings
- b. One set of bearing seals or O-rings
- c. One set of packing
- d. One disc seat (if replaceable)

## 3. Check Valves

- a. One set of seat rings
- b. One set of hinge bushings
- c. One set of pins



## 4. Ball Valves

- a. One set of bearings
- b. One set of bearing seals or O-rings
- c. One set of packing

- B. The following quantities of spare parts sets shall be furnished for each type and each size of valve installed.

Number of Valves Installed	Sets of Spare Parts Required
1 – 5	1
6 – 10	2
11 – 15	3
16 – 30	5
Greater than 30	15%

## 1.07 TOOLS

- A. The following tools shall be furnished for the valves:

1. Tee-Wrenches: One per every 5 valves installed

## 1.08 QUALITY ASSURANCE

- A. Manufacturer's Qualifications

1. Manufacturer shall have a minimum of three (3) years of experience in the production of substantially similar valve equipment, and shall show evidence of satisfactory service in the installations.
2. Each type of valve shall be the product of one manufacturer.

## 1.09 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Valves and appurtenances shall be handled carefully. Valves that are dropped, dented, cracked or otherwise damaged will not be acceptable.
- C. Provide full-face protectors of waterproof material fastened to each side of the valve body to protect joints and the valve interior.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. The following manufacturers are acceptable. Equivalent products of other manufacturers may be submitted for approval.
- B. Gate Valves
  - 1. U.S. Pipe and Foundry
  - 2. M & H Valve Co.
- C. Eccentric Plug Valves
  - 1. DeZurik
- D. Rubber Seated Ball Valves
  - 1. Henry Pratt Co.
- E. Butterfly Valves
  - 1. Henry Pratt Co.
  - 2. DeZurik
- F. Swing-check Valves for Liquid Service
  - 1. GA Industries, Inc.
- G. Check Valves for Air or Gas Service
  - 1. Crane Valve Co.
- H. Automatic Pressure Reducing, Pressure Sustaining and Electric Check Valves
  - 1. GA Industries, Inc.
- I. Motor-Operators (Open/Close and Modulating)
  - 1. Limitorque
  - 2. Rotork

## 2.02 MATERIALS - GENERAL

## A. Non-Ferrous Materials

1. Non-ferrous materials are all materials consisting of mixtures of copper, tin, zinc, lead, or other metals in which iron does not predominate.
2. Non-ferrous materials shall be provided with standard composition and physical properties conforming to ASTM standards except as otherwise indicated.
3. All non-ferrous materials shall be made from new metals of purest commercial quality. Scrap can be used only when it is the result of the processes of manufacture of articles of similar composition.
4. Bronze items shall have the following composition:
  - a. Composition A conforming to ASTM B 61 (Alloy UNS No. C92200) or B 62 (Alloy UNS No. C83600).
  - b. Composition B conforming to ASTM B 61 (Alloy UNS No. C92200) or an approved standard composition having good wear and corrosion resisting qualities and sufficiently ductile for peening into dove-tail grooves.
  - c. Composition C conforming to ASTM B 584, Copper Alloy UNS No. C86500 or C86400; or ASTM B 21, Copper Alloy UNS No. C46400; or ASTM B 124, Copper Alloy UNS No. 37700.
  - d. Composition D conforming to ASTM B 584, Copper Alloy UNS No. C86200 or C86700; or B 21, Copper Alloy UNS No. C46400.

B. Ferrous Materials: Cast iron of the valves, unless specified otherwise, shall conform to ASTM A 126, Class B.

C. Substitute Materials: Materials that are standard with the valve manufacturer but differ from the foregoing requirements and have similar or superior characteristics and are equally suitable for the purpose intended can be considered. Substitutions may be made only upon the written approval of the Commissioner.

## D. Castings

1. Castings shall be true to pattern, sound, smooth, and without injurious cold shuts, swells, lump scabs, scoria, sand holes or other defects and imperfections.

2. Weld repair will not be allowed without the written permission of the Commissioner. Map all defects over 1/4-inch wide or 1/4-inch deep. If such defects add up to ten percent or more of the total open surface area, then the casting will be rejected unless waived by the Commissioner. Map defects smaller than 1/4-inch if they are densely concentrated, and report to the Commissioner for approval or repair. Conduct repairs permitted by the Commissioner per approved procedures. Any acceptable casting defect that affects the paint integrity shall be plugged or filled using approved methods and only with the consent of the Commissioner.
3. All castings shall be thoroughly, inside and outside, free from sand and dust. Use wire brushes, scrapers or other approved mechanical appliances for this purpose. Do not use acid or other corrosive liquids in cleaning castings.
4. The thickness of metal in the body of an iron casting having a standard thickness of less than 0.8 inch can not be more than 0.08 inch less than the standard thickness; and the deficiency in thickness of castings having a standard thickness of 0.8 inch or more can not exceed the standard thickness by more than 10 percent. The above allowable deficiencies in thickness, however, cannot extend over more than one half the area of any casting.

## 2.03 METAL SEATED GATE VALVES - SOLID WEDGE AND DOUBLE DISC TYPE

### A. General

1. The valves shall conform to AWWA C500 and as specified herein.
2. Sizes
  - a. Non Rising-Stem (NRS): 4 in. through 48 in.
  - b. Outside Screw and Yoke (OS&Y) Rising-Stem: 4 in. through 12 in.
3. Type
  - a. Valves for buried service shall be NRS.
  - b. Valves for interior and exposed service shall be OS & Y unless specified otherwise.
  - c. NRS valves for interior and exposed service shall be provided with position indicators.
4. Design Working Pressures
  - a. Valves 12 Inches and Smaller: 200 psig
  - b. Valves 16 Inches and Larger: 150 psig

5. Maximum Fluid Temperature: 150 degrees F, unless otherwise specified.
  6. Tongue-and-groove guides shall be provided for solid-wedge valves.
  7. Rollers and tracks shall be provided for horizontal 16 in. and larger double disc valves.
  8. Double disc valves shall be provided with minimum four point wedging mechanism.
  9. Where shown on the Contract Drawings, bypasses shall be provided for valves 16 in. and larger. Bypasses shall be of bolted construction and the bypass valves shall be similar to the main valves. Minimum size of the bypass valves shall be as specified in AWWA C500.
  10. Unless otherwise specified, the gate valves shall be solid wedge gate type.
- B. Materials of Construction: All materials of construction shall conform to the requirements of AWWA C500 and shall be as follows for various valve components:
1. Body, Bonnet, Stuffing Box and Discs: Gray iron or ductile iron
  2. Seat and Disc Rings: Bronze, Composition A
  3. Stem and Stem Nut: Bronze, Composition C for valves up to 24 inches and Composition D for valves larger than 24 inches
  4. Disc Pin and Side Spreader: Bronze
  5. Top and Bottom Wedge Nuts: Cast iron with integrally cast bronze bushing
  6. Guide Contacts for 16 in. and Larger Valves: Bronze
  7. Rollers and Tracks: Bronze
  8. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel
  9. All Rubber Items: Buna-N
- C. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.
- D. Testing: All valves shall be shop tested in conformance with the requirement of AWWA C500.

## E. Gear Actuators for Manual Valves

1. The valves shall be provided with gear actuators conforming to the requirements of AWWA C500.
2. The gear actuators shall be sized for maximum differential pressures.

## 2.04 RESILIENT-SEATED GATE VALVES

## A. General

1. The valves shall conform to AWWA C509 and as specified herein.
2. Sizes: 4 in. through 12 in., 16 in. and 20 in.
3. Type: Rising or non-rising stem valves shall be furnished as specified.
4. Design Working Pressures:
  - a. Valves 12 in. and Smaller: 200 psig
  - b. Valves 16 in. and 20 in.: 150 psig
5. Maximum Fluid Temperature: 150°F
6. The valves shall be provided with fully encapsulated resilient wedges.

## B. Materials of Construction: All materials of construction shall conform to the requirements of AWWA C509 and shall be as follows for various valve components:

1. Body, Bonnet and Stuffing Box: Cast iron, ASTM A 126, Class B.
2. Wedge: Cast iron, symmetrically and fully encapsulated with molded rubber having minimum 1/8 in. thickness.
3. Stem: Manganese Bronze, ASTM B 584, Alloy UNS C86500.
4. All Rubber Items: Buna-N
5. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.

## C. Interior Coating: All valves shall be coated inside. The steel cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.

## D. Testing: All valves shall be tested in conformance with the requirements of AWWA C509.

## E. Gear Actuators for Manual Valves

1. The valves shall be provided with gear actuators conforming to the requirements of AWWA C500.
2. The gear actuators shall be sized for maximum differential pressures as specified.

## 2.05 ECCENTRIC PLUG VALVES

## A. General

1. The valves shall be quarter turn valves having an eccentric action that causes the plug to rise off the seat contact during the opening movement rather than sliding from its seat.
2. Sizes: 4-inch through 12-inch
3. Design Working Pressure: 175 psig
4. Maximum Fluid Temperature: 180°F
5. The valves shall have a minimum port area of 80 percent of the full area of the pipe in which the valves are installed.
6. The water-tightness or gas-tightness of the valve seating shall be adjustable. The valves shall have a seating adjustment device that is external to the valve and that can be used without the need to remove the valve from the piping and with the valve under pressure.
7. The valves shall have oil impregnated, permanently lubricated bearings in the upper and lower journals.
8. The valves shall have a stem seal consisting of multiple, self-adjusting and replaceable chevron type packing rings and a packing gland or shall have two replaceable, self-adjusting, U-cup seals. The stem seal shall be adjustable and replaceable without removing the valve from the piping and without the need to disassemble the valve and operator. For buried or submerged service, the stem seal shall have a sealed enclosure.
9. The valves shall have 3 and 4-way configuration when shown or specified.
10. Except for buried or submerged service, the valves shall have an external visible indication of plug position.

B. Materials of Construction: All materials of construction shall be as follows for various valve components:

1. Body: Cast iron, or semi-steel at least equal to ASTM A126, Class B
2. Plug: Neoprene or Buna-N facings
3. Seat Overlay: 90 percent pure nickel on all surfaces contacting the plug face with a minimum thickness of 1/16-inch for valve sizes 20-inch and smaller and a minimum of 1/8-inch for valve sizes 24-inch and greater
4. Bearings: Type 316 stainless steel
5. Bonnet bolts, studs, and nuts: Zinc plated carbon steel

C. Testing

1. Leakage Test: A plug leakage shop test shall be performed on each eccentric plug valve in the closed position. Unless otherwise specified, the leakage test shall be performed with a minimum pressure of 150 psig applied sequentially to both the upstream and downstream faces of the plug. The test shall be performed for a minimum duration of 15 seconds. The test must demonstrate that no leakage past the plug.
2. Hydrostatic Test: Hydrostatic shop tests shall be given to each eccentric plug valve with the plug open and with the plug closed. The hydrostatic tests shall be performed with a minimum pressure that is at least equal to the test pressure specified for the pipeline in which the valve is installed. The test shall be performed for a minimum duration of 30 seconds. The hydrostatic tests shall demonstrate that the valve is structurally sound and that there are no leaks through the external surfaces of the valve.

D. Operators

1. Valve sizes 6-inch or smaller shall be equipped with wrench or lever operators.
2. Valve sizes 8-inch or larger shall be equipped with gear operators.
3. For submerged or buried service, gear operators shall be housed in a watertight enclosure and valve operators shall be equipped with stainless steel external bolting.



## 2.06 RUBBER SEATED BALL VALVES

### A. General

1. The valves shall conform to AWWA C507 and as specified herein.
2. Sizes: 6 in. through 48 in.
3. Design Working Pressures: 150 psig, unless otherwise specified
4. Maximum Fluid Temperature: 180°F
5. The body shall have full, unobstructed, circular inlet and outlet port diameters equal to the size of the valve.
6. The valves shall provide drip-tight bi-directional shut-off at the design working pressure as well as operating pressure.
7. The valve bodies shall have support legs or pads to support the valve and actuator weight when installed in a horizontal pipeline.
8. The ball assembly shall be supported by a two-way thrust bearing assembly consisting of a stud and thrust collar in a grease packed cavity suitable for lifetime lubrication.
9. Valve seats shall seal a full 360 degrees circumference without interruption.
10. Valve seats shall be field adjustable around the 360 degrees circumference and replaceable without dismantling the operator, shaft or ball.
11. Packing shall be self-adjusting, chevron type and shall be accessible without having to dismantle the valve.

### B. Materials of Construction: All materials of construction shall conform to the requirements of AWWA C507 and shall be as follows for various valve components:

1. Body: Gray iron, ductile iron, or cast steel
2. Ball: Gray iron, ductile iron, or cast steel
3. Rubber Seats in Body, Bearing Seal O-Rings and Packing: Buna-N or other synthetic rubber suitable for the application.
4. Seating Surface on Ball: Type 316 stainless steel or nickel-chrome
5. Shaft: Type 316 stainless steel

6. Tapered Pins for Attachment of Shaft to Ball: Type 316 stainless steel
  7. Bearings: Teflon-lined with fiberglass backing, self-lubricating
  8. Thrust Collar and Stud Bolt of Thrust Bearing Assembly: Type 316 stainless steel
  9. Shaft Seals: Self-adjusting V-type chevron packing, material same as of rubber seats
  10. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.
- C. Testing: All valves shall be shop tested in conformance with the requirement of AWWA C507.
- D. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.
- E. Gear Actuator for Manual Valves
1. The valves shall be provided with gear actuators conforming to the requirements C507.
  2. Gear actuators for valves 10 in. and smaller shall be sized for the differential pressure equal to the design working pressure of the valve and port velocity of 35 feet per second.
  3. Gear actuators for valves larger than 10 in. shall be sized for maximum differential pressures and flow velocities as specified.

## 2.07 BUTTERFLY VALVES

### A. General

1. The valves shall conform to AWWA C504 and as specified herein.
2. Sizes
  - a. Flanged: 4 in. through 72 in.
  - b. Mechanical Joint: 4 in. through 48 in.
3. Design Working Pressure: 150 psig, Class 150B
4. Maximum Fluid Temperature: 180°F

5. The valves shall provide drip-tight bidirectional shut-off at the design working pressure as well as operating pressures as specified.
  6. Valve seats shall be mounted in the body. Rubber seats of 24 in. and larger valves shall be field replaceable.
  7. The valves shall be capable of being held in open, or partially open position for manual operation or for automatic operation. When the disc is so held, there shall be no chatter or vibration of the disc or operating mechanism.
  8. Valve packing shall be replaceable without dismantling the valve.
- B. Materials of Construction: All materials of construction shall conform to the requirements of AWWA C504 and shall be as follows for various valve components:
1. Body: Cast iron, ductile iron, or alloy cast iron
  2. Shaft: Type 316 stainless steel
  3. Discs
    - a. Valves Smaller than 30 in.: Cast iron
    - b. Valves 30 in. and Larger: Ductile iron
  4. Seats: Buna-N or other synthetic rubber suitable for the application
  5. Seating Surfaces: Type 316 stainless steel
  6. Bearings
    - a. Valves Smaller than 24 in.: Nylon
    - b. Valves 24 in. and Larger: Fiberglass with Teflon lining
  7. Shaft Seals: Self-adjusting V-type chevron, material same as of seats
  8. Tapered Pins for Attachment of Shaft to Disc: Type 316 stainless steel
  9. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.
- C. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.
- D. Testing: All valves shall be shop tested in conformance with the requirements of AWWA C504.

E. Gear Actuators for Manual Valves

1. The valves shall be provided with gear actuators conforming to the requirements of C504.
2. Gear actuators for valves 20 in. and smaller shall be sized for 150 psi differential pressure and 16 feet per second velocity.
3. Gear actuators for valves 24 in. and larger shall be sized based on maximum differential pressures and velocities as specified.

2.08 SWING CHECK VALVES

A. General

1. The valves shall conform to AWWA C508 and as specified herein.
2. Sizes: 4 in. through 24 in.
3. Type: Resilient-seated
4. Design Working Pressure:
  - a. Smaller than 12 in. Diameter: 175 psig
  - b. 12 in. Diameter and Larger: 150 psig
5. The valves shall be suitable for horizontal or vertical mounting.
6. The check valves shall have a clear waterway with full open area equal to the pipe size.
7. The check valves shall be provided with outside adjustable weight and lever.
8. Valves larger than 6 in. shall be provided with adjustable air cushion chambers.
9. Valve seats shall be mechanically attached and shall be field replaceable.

B. Materials of Construction: All materials of construction shall conform to the requirements of AWWA C508 and shall be as follows for various valve components:

1. Body, Disc, Cover and Gland: Cast-iron
2. Disc Arm: Ductile iron
3. Hinge Shaft: Type 316 stainless steel

4. Hinge Shaft Bushings: Bronze, ASTM B 62, Alloy UNS C83600
  5. Shaft End Plate: Type 316 stainless steel
  6. Body Seat and follower ring on rubber seat on disc: Type 316 stainless steel
  7. Disc Center Pin Assembly: Type 316 stainless steel
  8. Air Cushion Chamber:
    - a. Chamber and Plunger: Bronze, ASM B 62, Alloy UNS C83600
    - b. Linkages and Pins: Type 316 stainless steel
    - c. Air Check Valve and Tubing: Brass
  9. All Rubber Items:
    - a. Up to 180°F Fluid Temperature: Buna-N
    - b. Greater than 180°F Fluid Temperature: Viton
  10. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.
  11. Gland Packing: Graphite and Kevlar
- C. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.
- D. Testing
1. All valves shall be shop tested in conformance with the requirement of AWWA C508.
  2. Permitted Leakage at Design Working and Operating Pressures: Zero.

## 2.09 CHECK VALVES (AIR SERVICE)

### A. General

1. Design Working Pressure: 125 psig
2. Internal Temperature Rating: 250 °F
3. Maximum Head loss at Design Operating Condition:
4. The valves shall be tight seating against operating back pressure with zero leakage and shall operate without hammer or shock.

5. The valves shall be of double door type and spring loaded.

B. Materials of Construction:

1. Body: Cast iron, ASTM A 126
2. Double Doors: Aluminum alloy
3. Hinge and Stop Shafts: Type 316 stainless steel
4. Springs: Type 316 stainless steel
5. Seal Material: Viton, rated for minimum 250 °F
6. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.

C. Testing:

1. All valves shall be shop tested with water against leakage at the design rated and operating pressures.
2. Permitted Leakage: Zero
3. All valves shall be hydrostatically tested at twice the rated pressure.

2.10 AUTOMATIC PRESSURE REDUCING VALVES

A. General

1. Application: Reduce a higher fluctuating upstream pressure to a lower steady downstream pressure within a specified range of flow variations.
2. Rated Working Pressure
  - a. Smaller than 12-inch: 250 or 500 psig
  - b. 14-inch thru 36-inch: 250 psig
3. The set point downstream pressure shall be field adjustable within near zero to 110 percent range.
4. The valves shall not suffer cavitation damage within a 5-year period from the date of installation when exposed to the specified operating conditions.

**B. Valve Construction**

1. Type: Pilot operated globe or angle style valves as shown on the Contract Drawings.
2. The valves shall include a one-piece piston and a full stroke length liner. The seating shall include a replaceable resilient seat ring mounted on underside of the piston and a metal seat integral with the liner or attached to the valve body.
3. Provide V-ports for pressure control at low flows.
4. The flow area shall be equal to nominal pipe area when valve is fully open.
5. The valves shall provide a drip-tight shut-off at the rated pressure when closed.
6. Provide a removable flanged cover to access the valve internals.
7. Provide an indicator rod attached to the piston for visual position indication of the piston.
8. The pilot control piping shall include the following minimum items:
  - a. A needle valve for field adjustment of closing speed
  - b. A pilot valve to adjust the required set point downstream pressure
  - c. A Y-strainer with a valved blow-off connection
  - d. Isolation valves

**C. Materials of Construction**

1. Body: Cast iron, ASTM A126, Class B, or Ductile Iron, ASTM A536
2. Piston, liner, seat crown, indicator rod and hardware, vent tube and glands: Bronze, ASTM B62.
3. All Flexible Items: Buna-N, leather or other synthetic rubber suitable for the application
4. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel
5. Packing: Teflon
6. All control piping components including piping, tubing, fittings, valves and Y-strainer: Brass or bronze with stainless steel wetted trim. All small valves shall conform to Section 15112 – Valves Smaller than 4 Inches.

D. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, shall be epoxy coated in accordance with AWWA C550.

E. Testing

1. Test each assembled valve, except control piping, hydrostatically at 1-1/2 times the rated working pressure for a minimum of five minutes.
2. Test each valve for leakage at the rated working pressure against closed valve. The test duration shall be minimum 15 minutes and permitted leakage shall be zero.
3. Perform functional test on each valve to verify specified performance.

2.11 AUTOMATIC PRESSURE SUSTAINING VALVES

A. General

1. Application: Maintain a minimum set point upstream pressure regardless of variations in flow demand and/or variations in downstream pressure. The valve will open on an increase in upstream pressure and close on a decrease in upstream pressure to maintain the required set point upstream pressure.
2. Rated Working Pressure
  - a. 12-inch and Smaller: 250 or 500 psig
  - b. 14-inch thru 36-inch: 250 psig
3. The set point upstream pressure shall be field adjustable within near zero to 110 percent range.
4. The valves shall not suffer cavitation damage within a 5-year period from the date of installation when exposed to the specified operating conditions.

B. Valve Construction

1. Type: Pilot operated globe or angle style valves as shown on the Contract Drawings.
2. The valves shall include a one-piece piston and a full stroke length liner. The seating shall include a replaceable resilient seat ring mounted on underside of the piston and a metal seat integral with the liner or attached to the valve body.
3. Provide V-ports for pressure control at low flows.
4. The flow area shall be equal to nominal pipe area when valve is fully open.



5. The valves shall provide a drip-tight shut-off at the rated pressure when closed.
6. Provide a removable flanged cover to access the valve internals.
7. Provide an indicator rod attached to the piston for visual position indication of the piston.
8. The pilot control piping shall include the following minimum items:
  - a. A needle valve for field adjustment of closing speed
  - b. A pilot valve to adjust the required set point upstream pressure
  - c. A Y-strainer with a valved blow-off connection
  - d. Isolation valves

C. Materials of Construction

1. Body: Cast iron, ASTM A126, Class B, or Ductile Iron, ASTM A536.
2. Piston, liner, seat crown, indicator rod and hardware, vent tube and glands: Bronze, ASTM B62.
3. All Flexible Items: Buna-N, leather or other synthetic rubber suitable for the application.
4. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.
5. Packing: Teflon.
6. All control piping components including piping, tubing, fittings, valves and Y-strainer: Brass or bronze with stainless steel wetted trim. All small valves shall conform to Section 15112 - Valves Smaller than 4 Inches.

D. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, shall be epoxy coated in accordance with AWWA C550.

E. Testing

1. Test each assembled valve, except control piping, hydrostatically at 1-1/2 times the rated working pressure for a minimum of five minutes.
2. Test each valve for leakage at the rated working pressure against closed valve. The test duration shall be minimum 15 minutes and permitted leakage shall be zero.
3. Perform functional test on each valve to verify specified performance.

## 2.12 AUTOMATIC ELECTRIC CHECK VALVES

## A. General

1. Application: Valve shall open and close at a controlled rate during a pump start-up and shutdown. During emergency pump shutdown, due to power failure or other malfunctions, valve shall close quickly to minimize reverse flow through the pump.
2. Rated Working Pressure:
  - a. 12 inch and smaller: 250 or 500 psig
  - b. 14 inch thru 36 inch: 250 psig
3. Opening or Closing Time of Valve: One to five minutes, adjustable
4. Emergency Closing Time of Valve: 15 to 30 seconds, adjustable

## B. Valve Construction:

1. Type: Pilot operated globe or angle style valves as shown on the Contract Drawings
2. The valves shall include a one-piece piston and a full stroke length liner. The seating shall include a replaceable resilient seat ring mounted on underside of the piston and a metal seat integral with the liner or attached to the valve body.
3. Provide V-ports for optimum surge control during normal pump start-up and shutdown.
4. The flow area shall be equal to nominal pipe area when valve is fully open.
5. The valves shall provide a drip-tight shut-off at the rated pressure when closed.
6. Provide a removable flanged cover to access the valve internals.
7. Provide an indicator rod attached to the piston for visual position indication of the piston.
8. The pilot control piping shall include the following minimum items:
  - a. A solenoid operated pilot valve for normal controlled opening and closing of the check valve.
  - b. An emergency solenoid pilot valve for quick closing of the check valve.

- c. Manual separate needle valves for controlled normal opening and closing and for emergency closing of the check valve.
    - d. A Y-strainer with a valved blow-off connection
    - e. Isolation valves
  - 9. Provide SPDT limit switches with NEMA 4 enclosure as shown on the Contract Drawings.
- C. Materials of Construction
- 1. Body: Cast iron, ASTM A126, Class B, or Ductile Iron, ASTM A536
  - 2. Piston, liner, seat crown, indicator rod and hardware, vent tube and glands: Bronze, ASTM B62
  - 3. All Flexible Items: Buna-N, leather or other synthetic rubber suitable for the application
  - 4. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel
  - 5. Packing: Teflon
  - 6. All control piping components including piping, tubing, fittings, valves and Y-strainer: Brass or bronze with stainless steel wetted trim. All small valves shall conform to Section 15112 - Valves Smaller than 4 Inches.
- D. Interior Coating: All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, shall be epoxy coated in accordance with AWWA C550.
- E. Testing
- 1. Test each assembled valve, except control piping, hydrostatically at 1-1/2 times the rated working pressure for a minimum of five minutes.
  - 2. Test each valve for leakage at the rated working pressure against closed valve. The test duration shall be minimum 15 minutes and permitted leakage shall be zero.
  - 3. Perform functional test on each valve to verify specified performance.

## 2.13 ELECTRIC ACTUATORS (OPEN/CLOSE)

### A. Application Criteria

1. Ambient Temperature Rating: -20 to +150 °F
2. Ambient Humidity: 100 percent
3. Maximum design differential pressures and forward/reverse flows applicable to the valves:
4. Opening and Closing Speeds: 60 seconds
5. Power Supply: 480 volts, 3 phase, 60 Hz
6. Control Voltage: 120 volts, single phase, 60 Hz
7. Torques: Per valve manufacturer
8. Duty Cycle: 6 starts per hour, minimum

### B. General

1. Conform to the requirements of AWWA C540.
2. The actuator shall be operable with handwheel or chainwheel even after the electric motor has been disengaged and removed for repairs.
3. All valves with electric actuators located more than six feet above the operating floor shall be provided with separate control panels installed approximately five feet above the operating floor at an approved location. Electrical wiring shall be modified as required for the remote location of the control panels.
4. Sizing of each electric actuator shall be coordinated with the valve manufacturer who shall furnish the valve and the electric actuator as a unit.
5. The electric actuators shall be suitable for the valve orientation as shown on the Contract Drawings.
6. All electrical components shall conform to the area classification shown on the Contract Drawings.

### C. Electric Motor

1. Motor shall be in accordance with the requirements of Section 16220 - Electric Motors of the Contract. Motor shall be specifically designed for

valve actuator service. It shall have high torque characteristics and shall have a maximum continuous total temperature rating of 70 °C.

2. The motor shall be sized for at least 1.5 times the actuator torque requirement.

D. Actuator Gearing

1. Housing: Die-cast aluminum
2. Close coupled to electric motor
3. Input Shaft Gearing: Spur or bevel gear assembly
4. Output Shaft Gearing: Self-locking worm gears with minimum gear backlash to prevent valve disc chatter or vibration. The gearing shall be rated for twice the required actuator torque.
5. All gearing shall be of hardened alloy steel or a combination of hardened alloy steel and alloy bronze, accurately cut by hobbing machine.
6. Lubrication: Oil bath
7. Bearings: Ball or roller with a minimum B-10 life of 100,000 hours
8. Input Shaft: Hardened alloy steel
9. Provide mechanical stops adjustable to 5 degrees at each end of travel.

E. Limit Switches

1. Each actuator shall be provided with end of travel limit switches to allow control of desired end position for each direction of travel.
2. Open and close limit switches shall be geared to the drive mechanism and in step at all times, whether the unit is operated electrically or manually and whether or not the actuator is powered by the 3-phase power supply. Friction devices or setscrew arrangements shall not be used to maintain the setting.
3. Limit switch gearing shall be appropriately lubricated.
4. The driven mechanism shall be totally enclosed to prevent entrance of foreign matter or loss of lubricant.
5. Each actuator shall be provided with four auxiliary contacts. Two contacts shall close and two contacts shall open at a desired end position for each direction of travel.

6. Switches shall be rated 10 amperes at 120 volts.

F. Torque Switches

1. Adjustable torque switches shall be provided with each valve actuator. The torque switches shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches or other devices.
2. Torque switches shall be wired to de-energize the valve actuator motor in the event excessive torque is developed during either direction of travel.
3. It shall be possible to select the torque switches to control the open and close limit positions in either direction of valve travel.
4. Dry contacts (10A, 120 Vac) shall be provided for remote high torque alarm for automatically controlled valves.

G. Handwheel and Chainwheel Operation

1. The actuator shall be equipped with a handwheel for manual operation, so connected that operation by the motor will not cause the handwheel to rotate.
2. Should power be returned to the motor while the handwheel is in use, design of the unit shall prevent transmission of the motor torque to the handwheel.
3. The handwheel shall require an effort of no more than 80 pounds on the rim for seating or unseating load, or 60 pounds on running load.
4. The handwheel shall have an arrow and the word "Open" or "Close" indicating required rotation. The handwheel shall operate in the clockwise direction to close.
5. Chain Operators: All valves more than 6 feet-0 inches above the operating floor level shall be equipped with chain operators.
6. Handwheels and chain operators shall conform to Article 2.15.

H. Controls

1. Provide controls in a separate compartment integral with the actuator.
2. Enclosure: NEMA 6
3. Starter: Combination reversing magnetic starter with circuit breaker and disconnect switch

4. Control Power Transformer: Provide a transformer to transform the rated three phase, 60 Hz power to 120 volts, single phase. The transformer shall be complete with a grounded and fused secondary and dual primary fuses.
5. Provide Local/Off/Remote Selector Switch. "Local" position provides operation from open/close/stop push buttons. "Off" position disables local and remote operation. "Remote" position enables open/close/stop control from a remote source.
6. Open/close/stop push buttons with hold-to-run or momentary contact selection.
7. Open/close/stop indicating lights and 0-100 percent position indication on a liquid crystal display window.
8. Provide thermal overload and single phasing protection of the motor.
9. Provide a set of dry contacts to remotely indicate that the actuator is available for remote operation.
10. Actuator circuit boards shall be rated for high temperature service, minimum 55 degrees C.
11. Provide electrical interlocks as shown on the Contract Drawings.

I. Remote Mounted Control Panels

1. Where required by the valve location or as indicated on the Contract Drawings, remote control panels shall be provided.
2. Enclosure: NEMA 4X, Type 316 stainless steel.
3. Provide Local/Off/Remote Selector Switch. "Local" position provides operation from open/stop/close push buttons. "Remote" position enables open/close/stop control from remote source. "Off" position disables local and remote operation. Provide contact when switch is in remote position for remote indication.
4. Open/close/stop push buttons with hold-to-run or momentary contact selection.
5. Open/close/stop indicating lights and 0-100 percent position indication on liquid crystal display window.

J. Testing: Each actuator shall be shop tested in conformance with the requirements of AWWA C540.

## 2.14 ELECTRIC ACTUATORS (MODULATING)

## A. Application Criteria

1. Ambient Temperature Rating: -20 to +150 °F
2. Ambient Humidity: 100 percent
3. Maximum design differential pressures and forward/reverse flows applicable to the valves:
4. Duty Cycle: Continuous (minimum 1200 starts/stops per hour), unless otherwise specified
5. Power Supply: 480V, 3 ph, 60 Hz
6. Control Voltage: 120V, single phase, 60 Hz
7. Torque: Per valve manufacturer
8. Accepts 4 to 20 mAdc input to positioner.

## B. General

1. Actuator shall conform to the requirements of AWWA C540.
2. The actuator shall be operable with handwheel even after the electric motor has been disengaged and removed for repairs.
3. All valves with electric actuators located more than six feet above the operating floor shall be provided with separate push-button stations installed approximately five feet above the operating floor at an approved location. Electrical wiring shall be modified as required for the remote location of the control panels.
4. Sizing of each electric actuator shall be coordinated with the valve manufacturer who shall furnish the valve and the electric actuator as a unit.
5. The electric actuators shall be suitable for the valve orientation as shown on the Contract Drawings.
6. All electrical components shall conform to the area classification shown on the Contract Drawings.



**C. Electric Motor**

1. Motor shall be in accordance with the requirements of Section 16220 - Electric Motors of the Contract. Motors shall be specifically designed for valve actuator service, of high torque characteristics and minimum 70°C temperature rating.
2. The motor shall be sized for at least 1.5 times the actuator torque requirement.

**D. Actuator Gearing**

1. Housing: Die-cast aluminum
2. Close coupled to electric motor.
3. Input Shaft Gearing: Spur or bevel gear assembly.
4. Output Shaft Gearing: Self-locking worm gears with minimum gear backlash to prevent valve disc chatter or vibration. The gearing shall be rated for at least twice the required actuator torque.
5. All gearing shall be of hardened alloy steel or a combination of hardened alloy steel and alloy bronze, accurately cut by hobbing machine.
6. Lubrication: Oil bath
7. Bearings: Ball or roller with a minimum B-10 life of 100,000 hours
8. Input Shaft: Hardened alloy steel
9. Provide mechanical stops adjustable to  $\pm 5$  degrees at each end of travel.
10. Provide mechanical position indication.

**E. Limit Switches**

1. Each actuator shall be provided with 'end of travel' limit switches to allow control of desired end position for each direction of travel.
2. Open and close limit switches shall be geared to the drive mechanism and in step at all times, whether the unit is operated electrically or manually and whether or not the actuator is powered by the 3-phase power supply. Friction devices or setscrew arrangements shall not be used to maintain the setting.
3. Limit switch gearing shall be appropriately lubricated.

4. The driven mechanism shall be totally enclosed to prevent entrance of foreign matter or loss of lubricant.
5. Each actuator shall be provided with four auxiliary contacts. Two contacts shall close and two contacts shall open at a desired end position for each direction of travel.
6. Switches shall be rated 10 amperes at 120 volts.

F. Torque Switches

1. Adjustable double-torque switches shall be provided with valve actuator.
2. The torque switches shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches or other devices.
3. Torque switches shall be wired to de-energize the valve actuator motor in the event excessive torque is developed during either direction of travel.
4. It shall be possible to select the torque switches to control the open and close limit positions in either direction of valve travel.
5. Dry contacts (10A, 120 Vac) shall be provided for remote high torque alarm for automatically controlled valves.

G. Handwheel and Chainwheel Operation

1. The actuator shall be equipped with a handwheel for manual operation, so connected that operation by the motor will not cause the handwheel to rotate.
2. Should power be returned to the motor while the handwheel is in use, design of the unit shall prevent transmission of the motor torque to the handwheel.
3. The handwheel shall require an effort of no more than 80 pounds on the rim for seating or unseating load, or 60 pounds on running load.
4. The handwheel shall have an arrow and the word "Open" or "Close" indicating required rotation. The handwheel shall operate in the clockwise direction to close.
5. Chain Operators: All valves more than 6 feet-0 inches above the operating floor level shall be equipped with chain operators.
6. Handwheels and chain operators shall conform to Article 2.24.

## H. Controls

1. Provide controls in a separate compartment integral with the actuator.
2. Enclosure: NEMA 6
3. Starter: Combination reversing magnetic starter with circuit breaker and disconnect switch.
4. Control Power Transformer: Provide a transformer to transform the rated three phase, 60 Hz power to 120 volts, single phase. The transformer shall be complete with a grounded and fused secondary and dual primary fuses.
5. Provide Local/Off/Remote selector switch. "Local" position provides operation from open/close/stop push buttons. "Off" position disables local and remote operation. "Remote" position enables open/close/stop control from a remote source.
6. Open/close/stop push buttons with hold-to-run or momentary contact selection.
7. Open/close/stop indicating lights and 0-100 percent position indication on a liquid crystal display window.
8. The motor shall be de-energized in the event of a jammed valve.
9. Provide thermal overload and single phasing protection of the motor.
10. For monitoring of the actuator, provide a set of SPDT dry contacts. The monitor relay shall indicate that the actuator is available for remote operation.
11. Supply each actuator with a position controller. The controller shall have the following features:
  - a. Receive a 4-20 mA<sub>dc</sub> analog control signal and position the valve in proportion to this signal.
  - b. Adjustments for duty cycle, band width, span, and zero.
  - c. On loss of control signal the valve shall stay in its last position.
  - d. Provision for adequate cooling of the unit.
12. Provide actuator with a position transmitter capable of producing a 4-20 mA<sub>dc</sub> output signal. Unit shall be a standard slidewire (potentiometer) position transducer which shall provide an output corresponding to 0-100 percent of travel. Accuracy shall be 1 percent of scale. It shall include an

integral temperature-compensated, constant-current source for slidewire excitation. Transmitter shall be integral to the actuator.

13. Supply actuator with circuit boards for high temperature service, minimum 55 degrees C.

I. Remote Mounted Control Panels

1. Where required by the valve location or as indicated on the Contract Drawings, remote control panels shall be provided.
2. Enclosure: NEMA 4X, Type 316 stainless steel.
3. Provide Local/Off/Remote Selector Switch. "Local" position provides operation from open/close/stop push buttons. "Remote" position enables 4-20 mA dc control from remote source. "Off" position disables local and remote operation. Provide contact when switch is in remote position for remote indication.
4. Open/Stop/Close push buttons with hold-to-run or momentary contact selection.
5. Open/close/stop indicating lights and continuous valve position indication with LCD display.

- J. Testing: Each actuator shall be shop tested in conformance with the requirements of AWWA C540.

2.15 APPURTENANCES FOR EXPOSED METALLIC VALVES

A. General

1. All valves located less than 6 feet high above the operating floor shall be provided with handwheels or levers. All 6 inch and larger valves shall be provided with handwheels and 4-inch quarter turn valves shall be provided with levers, unless otherwise shown or specified.
2. All valves located at 6 feet or more above the operating floor shall be provided with chain operators.
3. Where indicated, the valves shall be provided with extension stems and floorstands.

B. Handwheels

1. All handwheels shall conform to the applicable AWWA Standards.

2. Material of Construction: Ductile iron or cast aluminum.
3. Arrow indicating direction of opening and word "OPEN" shall be cast on the trim of the handwheel.
4. Maximum Handwheel Diameter: 30 inches.

C. Chain Operators

1. All valves more than 6 feet above the operating floor shall be provided with chain operators.
2. Chains shall extend to three feet above the operating floor.
3. A 1/2-inch stainless steel hook bolt shall be provided to keep the chain out of the walking area.
4. Materials of Construction:
  - a. Chain: Type 316L stainless steel
  - b. Chain wheel: Recessed groove type made out of Type 316 stainless steel
  - c. Guards and Guides: Type 316L stainless steel
5. Chain Construction: Chain shall be of welded link type with smooth finish. Chain that is crimped and has links type with exposed ends that may cause injury shall not be acceptable.
6. Provide geared operators where required to position chain wheels in vertical position.

D. Crank Operator

1. Crank operator shall be removable and fitted with a rotating handle.
2. Maximum Radius of Crank: 15 inches
3. Materials:
  - a. Crank: Cast iron or ductile iron
  - b. Handle: Type 304 stainless steel
  - c. Hardware: Type 304 stainless steel
4. Extension Stems and Floorstands for Gate Valves:
5. Sizing of the complete lifting mechanism shall conform to the applicable requirements of AWWA C501.

6. Bench and Pedestal Floorstands
  - a. The valves requiring extension stems shall be provided with bench or pedestal floorstands as indicated.
  - b. Type: Heavy-duty with tapered roller bearings enclosed in a weatherproof housing, provided with positive mechanical seals around lift nut and pinion shaft to prevent loss of lubrication and to prevent moisture from entering the housing. A lubrication fitting shall be provided for grease. The base shall be machined.
7. Extension Stems
  - a. Maximum Slenderness Ratio (L/R): 100
  - b. Minimum Diameter: 1.5 in.
  - c. Threads: ACME
  - d. A top nut and a bottom coupling shall be provided on the stem with required pins and set screws.
8. Stem Guides
  - a. Maximum Stem Length between Guides: 7 feet
  - b. Stem guides shall be adjustable in two directions
9. Materials of Construction
  - a. Floorstand Housing: Cast-iron, ASTM A126, Class B
  - b. Lift Nut: Cast bronze, ASTM B 98
  - c. Wall Brackets for Floorstands: Type 316L stainless steel
  - d. Stem and Stem Couplings: Type 316 stainless steel
  - e. Top Nut, Bottom Coupling and Hardware: Type 316 stainless steel
  - f. Stem Guides: Type 316 cast stainless steel
  - g. Grease Fitting: Stainless steel
  - h. All Bolting: Type 316 stainless steel
10. Stem Covers shall be furnished with clear butyrate plastic or grade 153 Lexan pipe stem covers. The cover shall be furnished with a cast adaptor for mounting cover to bench and floor stands. Stem cover shall be designed and furnished with gasketing and breathers to eliminate water intrusion into operator and condensation within the cover. The cover shall be provided with mylar tape with legible markings showing the gate position at one inch intervals and open/close limits of the gates.

## 2.16 APPURTENANCES FOR BURIED METALLIC VALVES

## A. Wrench Nuts

1. Wrench nuts shall be provided on all buried valves and shall be of nominal 2-inch size conforming to AWWA C500.
2. Arrow indicating direction of opening the valve shall be cast on the nut along with the word OPEN.
3. Material: Ductile iron
4. The nut shall be secured to the stem by mechanical means.

## B. T-Handle Operating Wrenches

1. Contractor to provide from valve manufacturer.
2. Provide T-Handle operating wrenches in lengths to permit operation of all valves by operators.
3. Number of wrenches required: 2

## C. Extension Stems for Non-Rising Stem Gate Valves and Quarter Turn Buried Valves:

1. Extension stems shall be provided to bring the operating nut to 6 inches below the box cover.
2. Minimum Size and Material: Same as valve stem
3. Maximum Unsupported Length: 3 feet

## D. Valve Boxes

1. Valve boxes shall be as indicated and as required.
2. Type: Heavy duty, suitable for highway loading, telescopic, and adjustable
3. Material: Cast or ductile iron
4. Coating: Two coats of asphalt varnish conforming to Federal Specification TT-C494.
5. Marking: As required for service

## 2.17 ANCHOR AND MISCELLANEOUS MOUNTING BOLTS

- A. All bolts, nuts and washers furnished for connection of the valve appurtenances to the concrete structure or other structural members shall be furnished by the valve equipment manufacturer, and shall be of ample size and strength for the purpose intended. Anchor bolts shall be hooked or adhesive type. Bolts and washers shall be of Type 316 stainless steel, and nuts shall be Nitronic 60.

## 2.18 PAINTING OF EXPOSED VALVES AND APPURTENANCES

- A. Exterior steel, cast-iron, and ductile iron surfaces except machined or bearing surfaces of all exposed valves and appurtenances shall be finish painted in the shop. The surface preparation, priming, finish painting, and field touch-up painting shall conform to Sections 09911 - Exterior Painting and 09912 - Interior Painting, as applicable.

## 2.19 PAINTING OF BURIED VALVES

- A. Exterior steel, cast-iron, and ductile iron surfaces except machined or bearing surfaces of all buried valves shall be shop-painted with two coats of asphalt varnish conforming to Federal Specification TT-C 494.

## 2.20 INSPECTION AND SHOP TESTS

- A. Allow for inspection and testing of valves 20 inches or larger by the Commissioner at the place of manufacture.
- B. The City of New York may elect to conduct shop inspection on any size valves. The inspection may include but not be limited to: quality of the castings and other major components, mechanical and chemical testing, material sampling, material certifications, traceability of parts, blasting and painting and hydrostatic testing of the valves.
- C. Where required, shop testing of the valves shall be witnessed. Test valves hydrostatically at twice the rated working pressure and then test them for leakage at the rated working pressure. Apply the rated working pressure alternately to each side of the close valve, or in the case of parallel seated gate valves, between the discs. For check valves, apply the rated working pressure against the direction of flow.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in accordance with manufacturer's instructions.



- B. All valves shall be installed so that operating handwheels or levers may be conveniently turned from operating floor without interfering with access, and shall be as approved by the Commissioner. Chain operators shall be oriented out of the way from the walking areas.
- C. For motor-operated valves located lower than six feet above the operating floor, the orientation of the motor actuator shall permit easy access to the push buttons and the handwheel.
- D. All valves shall be installed plumb and level. The valves shall be free from distortion and strain caused by misaligned piping, equipment or other causes.
- E. For buried valve installations, the valve boxes shall be set plumb and centered, with carefully tamped to a lateral distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.
- F. Plug valves in horizontal sludge lines shall be installed with the stem horizontal. The plugs shall be on top when open and on pressure side when closed. Valves in vertical sludge lines shall be installed with the plug at the top when closed.

### 3.02 FIELD TESTS AND ADJUSTMENTS

- A. All parts and components shall be adjusted as required to provide correct operation.
- B. A functional field test of each valve shall be conducted in the presence of the Commissioner to demonstrate that each part and all components function together correctly.

### 3.03 MANUFACTURER'S SERVICE

- A. Where required, the Contractor shall provide the services of qualified factory-trained service technicians to check and approve the installation.

-END OF SECTION-

**Section 15112**  
**VALVES SMALLER THAN 4 INCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall provide all labor materials, equipment and incidentals as shown, specified and required to furnish and install valves smaller than 4 inches complete with appurtenances. All valves smaller than 4 inches shall be furnished under this specification unless specifically indicated on the schedule and shown on the Contract Drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09912 - Interior Painting
- B. Section 11570 - Dust Suppression System
- C. Section 13861 - Odor Control System
- D. Section 15076 - Piping and Equipment Identification
- E. Section 15111 - Valves 4-Inch and Larger

**1.03 REFERENCES**

- A. American National Standards Institute (ANSI)
  - 1. B16.1, Cast Iron Pipe Flanges and Flanged Fittings
  - 2. A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- B. American Society for Testing and Materials (ASTM)
  - 1. A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
  - 2. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
  - 3. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- C. American Water Works Association (AWWA)
  - 1. C500, Metal-Seated Gate Valves for Water Supply Service.
  - 2. C508, Swing-Check Valves for Waterworks Service, 2 in. through 24 in.
  - 3. C509, Resilient-Seated Gate Valves for Water Supply Service.
  - 4. C540, Power-Actuating Devices for Valve and Sluice Gates.

D. Military Specification

1. MIL-C-27487, Coupling Halves, Quick-Disconnect, Cam-Locking Type.

1.04 GENERAL REQUIREMENTS

- A. All valves shall turn clockwise to close, unless otherwise specified.
- B. All valves shall have permanent markings for direction to open.
- C. All materials of construction of the valves shall be confirmed suitable for the application by the valve manufacturer.
- D. All valves shall have manufacturer's name and rated pressure cast in raised letters on the valve body.
- E. The valves shall be provided with identification conforming to the requirements of Section 15076 - Piping and Equipment Identification.

1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Working Drawings:
  1. Product data sheets for make and model
  2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction
  3. Power and control wiring diagrams, including terminals and numbers
  4. Manufacturer's qualifications
  5. Confirmation of suitability of the valve materials for the application
  6. Complete motor nameplate data
  7. Certificates of compliance with AWWA Standards where applicable
  8. Spare Parts List
  9. Special Tools List
  10. Valve manufacturer(s) certified test results of shop testing

- C. Operation and Maintenance Data: Submit complete manuals including:
1. Copies of all Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information
- D. Samples
1. One foot of chain for chain wheel operated valves

#### 1.06 SPARE PARTS

- A. The following quantities of spare valves shall be furnished for each type and size of valve installed.

Number of Valves Installed	Sets of Spare Valves Required
1-5	1
6-10	2
11-15	3
16-30	5
Greater than 30	15%

#### 1.07 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
1. Manufacturer shall have a minimum of three (3) years of experience in the production of substantially similar valve equipment, and shall show evidence of satisfactory service in at least 5 installations.
  2. Each type of valve shall be the product of one manufacturer.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Valves and appurtenances shall be handled carefully. Valves which are dropped, dented, cracked or otherwise damaged will not be acceptable.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. The following manufacturers are acceptable. Equivalent products of other manufacturers may be submitted for approval.
- B. Solenoid Valves
1. Automatic Switch Company
  2. Automatic Valve Company
- C. Ball Valves
1. Stockham Valves and Fitting Company
  2. Lunkenheimer Company
  3. Swagelok
- D. Globe Valves
1. Stockham Valves and Fitting Company
  2. Lunkenheimer Company
- E. Check Valves
1. Stockham Valves and Fitting Company
  2. Lunkenheimer Company
- F. Gate Valve
1. Stockham Valves and Fitting Company
  2. Lunkenheimer Company
- G. Needle Valves
1. Stockham Valves and Fitting Company
  2. Lunkenheimer Company
- H. Pressure Reducing Valves
1. Cla-Val Company
  2. Watts Regulator Company
- I. Hose Valves
1. Crane Valves
  2. W.M. Powell Company, Powell Valves

## J. Corporation Stops

1. Mueller Company
2. A.Y. McDonald Manufacturing Company

## K. Strainers

1. Mueller Steam Specialty Company
2. Armstrong Steam Specialty Company

## L. Quick Connect Couplings

1. Civacon, Kamlok, Dover Resources Company
2. PT Coupling Company

## M. Dielectric Pipe Couplings

1. Watts Regulator Company
2. EPCO Sales, Inc.

## N. Electric Motor Actuators

1. Limitorque
2. Rotork

## O. Valve Chain Operators

1. Babbitt Steam Speciality Co.

## 2.02 MATERIALS - GENERAL

## A. Non-ferrous Materials

1. Non-ferrous materials are materials consisting of mixtures of copper, tin, zinc, lead, or other metals in which iron does not predominate.
2. Non-ferrous materials shall have standard composition and physical properties conforming to ASTM standards except as otherwise indicated.

## B. Valves

1. Cast iron valves shall conform to ASTM A126, Class A.
2. Type 316 stainless steel bolts and studs shall conform to ASTM A193, Grade B.
3. Carbon steel bolts shall conform to ASTM A307, Grade A.

## 2.03 VALVES FOR METALLIC PIPE LINES

## A. Solenoid Valves

1. Type: Packless construction with screwed end connections and threaded conduit connection.
2. Materials: Bronze body and wetted parts with type 304 stainless steel hardware.
3. Coil: Continuous duty, epoxy encapsulated.
4. Failure Mode: Fail open, energize to close, unless otherwise specified.
5. Electrical Power: 120 volt, 60 Hz, single phase.
6. Each solenoid valve shall be protected with a strainer upstream.

## B. Ball Valves

1. Body: Bronze, semi-steel or Stainless Steel as specified.
2. Ball, Stem Handle and Hardware: Type 316 stainless steel.
3. Seat, Packing and Gasket: Teflon.
4. End Connections: Screwed.
5. Rating: 150 psig Water, Oil or Gas (W.O.G.).
6. Ball Valves for Dust Suppression and Odor Control systems shall meet the requirements of Section 11570 – Dust Suppression System, and Section 13861 – Odor Control System.

## C. Globe Valves

1. Type: Composition or plug-type disc, union bonnet.
2. Materials: Bronze and brass.
3. End Connections: Screwed.
4. Rating: 150 psig Steam Working Pressure (SWP).
5. Compressed Air Piping: Composition disc.
6. Copper and Brass Piping: Plug-type disc.

## D. Check Valves

1. Type: Swing, regrindable bronze disc, screw-in cap.
2. Materials: Brass and bronze, or stainless steel as specified.
3. End Connections: Screwed.
4. Rating: 200 psig Steam Working Pressure (SWP).
5. 2 and 2 1/2-inch swing check valves shall conform to AWWA C508.
6. 3-inch and Larger Valves: Conform to the requirements of Section 15111 – Valves 4-Inch and Larger.

## E. Gate Valves

1. Type: Solid wedge, rising stem.
2. Body and Wetted Parts: Bronze.
3. Handle and Hardware: Type 316 stainless steel.
4. End Connections: Screwed.
5. Rating: 150 psig Water, Oil or Gas (W.O.G.).
6. 3-inch Valves: Resilient seated conforming to the requirements of Section 15111 - Valves 4-Inch and Larger.

## F. Needle Valves

1. Type: Long tapered plug for fine flow regulation.
2. Body and Wetted Parts: Bronze.
3. Handwheel: Malleable iron.
4. Hardware: Type 316 stainless steel.
5. End Connections: Screwed.
6. Rating: 150 psig.

## G. Pressure Reducing Valves

1. Type: Balanced, soft closing, single seat. Constant downstream pressure regardless of upstream pressure or flowrate. Drop tight shutoff when downstream pressure greater than spring setting.
2. Strainer: Integral with the valve, Type 316 stainless steel.



3. Body and Cover: Bronze with pressure gauge taps.
4. Trim: Type 316 stainless steel.
5. End Connections: Screwed.
6. Diaphragm: Ethylene Propylene Diene Terpolymer (EPDM), fully guided at top and bottom
7. Pressures and Flows

#### H. Hose Valves

1. Type: Chicago pattern
2. Materials: Bronze body with brass trim
3. Operator: Tee handle
4. Pipe End Connection: Threaded
5. Hose Connection: 1-1/2-inch NPT for 1-1/2 inch hose, quick connect couplings for larger hoses

### 2.04 APPURTENANCES AND MISCELLANEOUS ITEMS

#### A. Corporation Stops

1. Type: AWWA standard tapered thread, ball valve
2. Material: Bronze
3. End Connection
  - a. Copper Pipe: Threaded flare
  - b. Thermoplastic Pipe: Compression with Type 304 stainless steel stiffener rings
4. Type: Y-pattern
5. Body
  - a. Metallic Piping: Bronze, screwed ends
  - b. Thermoplastic Piping: Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds, true union ends

6. Screens: Monel, No. 20 mesh, 2.5 times the inlet area
  7. Rating: 125 psig
- B. Quick Connect Couplings
1. Type: Dual cam and groove, male end dimensionally similar to MIL-C-27487, with dust cap, Type 304 stainless steel chain and lock
  2. Body: Cast iron
  3. Cam Arms: Type 304 stainless steel
  4. Gaskets: Buna-N
- C. Dielectric Pipe Couplings:
1. Provide at every location where copper pipe connects to steel, stainless steel or ductile iron pipe or equipment.
  2. Body: Steel with non-conducting bushings on each end
  3. End Connections: Screwed
  4. Rating: 200 psig at 225°F
- D. Valve Boxes, Floor Boxes and Operating Wrenches
1. Provide in accordance with Section 15111 - Valves 4-Inch and Larger.
- E. Electric Motor Actuators: Electric motor actuators shall conform to the requirements of AWWA C540 and shall have the following characteristics.
1. Type: Open-Close, reversing
  2. Open-Close Time for Ball Valves: 10 seconds
  3. Open-Close Time for Diaphragm Valves: 60 seconds maximum
  4. Housing: NEMA 4X with corrosion resistant epoxy coating
  5. Power: 120 volt, 60 hz, single phase
  6. SPDT switches shall be provided for remote valve position indication.
  7. Space heater and thermostat shall be provided in the housing.

8. Integral thermal overload protection shall be provided with automatic reset.
9. Limit switches shall be in accordance with Section 15111- Valves 4-Inch and Larger.

F. Valve Chain Operators

1. All ball, butterfly and diaphragm valves 1-1/2-inch and larger located more than 6 feet-0 inches above the operating floor level shall be equipped with a manual gear operator mounting assembly and a chain operator adapted to fit the gear operator, chain guide and sprocket wheel bolted directly to the valve operating wheel.
2. Aluminum or type 316 stainless steel chain shall be provided to hang three feet above the operating floor. All operators shall be equipped with a 1/2-inch hook bolt located to keep chain out of walking areas or to permit access to equipment.
3. Chain shall be of welded link type with smooth finish. Chain that is crimped and has links type with exposed ends that may scratch or cut the operator shall not be acceptable.
4. A one-foot sample of chain shall be provided for approval as specified herein before.

2.05 TESTING

- A. The following valves shall be tested in conformance with the requirement of AWWA Standards:
1. 3-inch metal-seated gate valve - C500
  2. 3-inch resilient-seated gate valve - C509
  3. 2, 2 ½ and 3-inch swing check valves - C508
- B. All other valves and valve sizes shall be tested in accordance with the manufacturer's standard test procedures.

2.06 PAINTING

- A. All valves and appurtenances shall be painted in accordance with Section 09912 - Interior Painting.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in accordance with manufacturer's instructions.
- B. All valves shall be installed so that operating handwheels or wrenches may be conveniently turned from operating floor without interfering with access, and shall be as approved by the Commissioner.
- C. All valves shall be installed plumb and level. The valves shall be free from distortion and strain caused by misaligned piping, equipment or other causes.
- D. For buried valve installations, the valve boxes shall be set plumb and centered, with carefully tamped to a lateral distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

### 3.02 FIELD TESTS AND ADJUSTMENTS

- A. All parts and components shall be adjusted as required to provide correct operation.
- B. A functional field test of each valve shall be conducted in the presence of the Commissioner to demonstrate that each part and all components function together correctly.

### 3.03 MANUFACTURER'S SERVICE

- A. Where required, the Contractor shall provide the services of qualified factory-trained service technicians to check and approve the installation.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 15120**  
**INTERIOR AND EXPOSED PIPING SCHEDULES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall furnish and install all interior and exposed piping as indicated in the interior and exposed piping schedules, and as specified in the Division 15.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02505 - Leakage Tests
- B. Section 15051 - Ductile Iron Pipe
- C. Section 15052 - Steel and Stainless Steel Pipe
- D. Section 15081 - Piping Insulation
- E. Section 15141 - Disinfection
- F. Section 15191 - Diesel Fuel Piping
- G. Section 15771 - Electric Heat Tracing Systems

**1.03 SCHEDULES**

- A. All piping shall be provided as listed in the following schedules:
- 1. Schedule 15120 Interior and Exposed Piping.
- B. Nomenclature for nominal pipe size ranges shall be as follows: "to" means all pipe sizes within the listed range including the upper listed size, and "up to" means all pipe sizes within the listed range not including upper listed size.
- C. Exposed or interior piping includes all piping that is not buried below ground, encased in concrete, or below the lowest finished floor elevation in structures.
- D. All rubber gaskets used in piping joints shall be suitable for the application.
- E. Abbreviations used in the pipe schedules are (Not All Used On This Project):
- 1. Material
    - GALV - Galvanized
    - 304LSS - 304L Stainless Steel
    - 316LSS - 316L Stainless Steel (Low carbon)
    - BR - Brass
    - DI - Ductile Iron
    - CI - Grey Cast Iron
    - CS - Carbon Steel
    - CU - Copper

FRP	-	Fiberglass Reinforced Plastic
HDPE	-	High Density Polyethylene
PE	-	Polyethylene
CPVC	-	Chlorinated Polyvinyl Chloride
PVC	-	Polyvinyl Chloride

## 2. Wall Thickness

CL	-	Class
PCL	-	Pressure Class
SCH	-	Schedule
SDR	-	Standard Diameter Ratio
STCL	-	Special Thickness Class
STD	-	Standard

## 3. Type of Joint

BS	-	Bell and Spigot
COMP	-	Compression
FLG	-	Flanged
GR	-	Grooved
LW	-	Lap Welded
MJ	-	Mechanical Joint
POJ	-	Push On Joint
RPOJ	-	Restrained Push on Joints
SD	-	Soldered
SSC	-	Split Sleeve Coupling
SW	-	Solvent Welded
THD	-	Threaded
WLD	-	Welded

## 4. Type of Fittings

304LSS	-	304L Stainless Steel
316LSS	-	316L Stainless Steel (Low Carbon)
CI	-	Grey Cast Iron
CU	-	Copper
DI	-	Ductile Iron
CS	-	Carbon Steel
BR	-	Brass
FRP	-	Fiberglass Reinforced Plastic
HDPE	-	High Density Polyethylene
PE	-	Polyethylene
CPVC	-	Chlorinated Polyvinyl Chloride
PVC	-	Polyvinyl Chloride

## 5. Protection

## Interior Lining

AC	-	Asphalt Coated
BA	-	Basalt Lined
CL	-	Cement Lined
CT	-	Coal Tar
FBEC	-	Fusion Bonded Epoxy Coated
GALV	-	Galvanized
GL	-	Glass Lined
PEL	-	Polyethylene Lined

## Exterior Coating

AC	-	Asphalt Coated
CT	-	Coal Tar
GALV	-	Galvanized
PR	-	Shop Primed (and field painted per Section 09911 - Exterior Painting or Section 09912 - Interior Painting)
TC		Tape Coated
W		Wrapped

## 6. Service Abbreviations:

See Contract Drawing abbreviations

PART 2 PRODUCT (Not Used)

PART 3 EXECUTION (Not Used)



## INTERIOR AND EXPOSED PIPING SCHEDULE

Service	Size (inches)	Pipe Material	Protective Coatings		Joints	Test Pressure (psig) <sup>(3)</sup>	Pipe Class or Thickness	Insulation Thickness (inches)	Jacket Material	Remarks
			Interior	Exterior						
Bilge Water Collection	3, 4, 8	DI	CL	PR	RPOJ, FLG	25	CL 56	NA	NA	NA
Bilge Pipe Drain	2	CS	--	PR	THD	10	SCH 40	1-1/2	Stainless steel	--
Dust Suppression	3/4	316LSS	--	--	WLD, COMP	2,000	0.065"	1	Aluminum	See Note 7.
	1/2	316LSS	--	--	WLD, COMP	2,000	0.049"	1	Aluminum	See Note 7.
	3/4	316LSS	--	--	WLD, COMP	2,000	0.065"	1	Aluminum	See Note 7.
Odor Control	1/2	316LSS	--	--	WLD, COMP	2,000	0.049"	1	Aluminum	See Note 7.
Dust Suppression Drain	1, 2	316LSS	--	--	WLD, COMP	25	SCH 40	--	--	See Note 7
Odor Control Drain	1/2	316LSS	--	--	WLD, COMP	25	SCH 40	1	Aluminum	See Note 7
Service Water	2-1/2, 3, 4	CU	--	--	SD	150	TYPE K	1-1/2, 2, 2-1/2	Aluminum	See Note 7.
City Water	4	CU	--	--	SD	150	Type K	--	--	--
	1	CU	--	--	SD	150	Type K	--	--	--
	4-8	DI	CL	AC	RPOJ	150	350	2-1/2	Stainless Steel	See Note 4.
Compressed Air	3/8, 1/2, 3/4, 1	316LSS	--	--	WLD,	250	SCH 80	--	--	--
Oil Tank Vent	2,4,6	CS	--	PR	THD	25	SCH 40	--	--	--
Waste Oil Drain	3	CU	--	--	THD	25	TYPE K	--	--	--
Motor Oil & Hydraulic Oil Dispensing	1/2	316LSS	--	--	WLD	150	SCH 40	--	--	--
Diesel Fuel Piping	2/4	304LSS/ FRP	--	--	WLD/SW	150	SCH 40	--	--	See Note 8

## General Notes:

1. Wall thickness shall be as specified.
2. All connections to valves and equipment shall be made with flanged joints.
3. Pressure and leakage testing requirements and procedures are specified in Section 02505 - Leakage Tests.
4. Heat trace and insulate exterior piping as shown on the Contract Drawings and in accordance with Sections 15081 - Piping Insulation and 15771 - Electric Heat Tracing Systems.
5. No field welding of stainless steel pipe will be permitted. Provide flanged joints for field connection of stainless steel pipe in accordance with Section 15052 - Steel and Stainless Steel Pipe.
6. Use temporary tie rods at all expansion joints during pressure testing of piping.
7. Heat trace and insulate interior piping as shown on the Contract Drawings and in accordance with Sections 15081 - Piping Insulation and 15771 - Electric Heat Tracing Systems.
8. Diesel fuel piping shall be double wall containment piping with 2 inch type 304 L stainless steel carrier and 4 inch FRP containment pipe as specified in Section 15191 - Diesel Fuel Piping. Diesel fuel piping shall also be incased in concrete when passing through the building. No other pipe lines shall be incased in the same concrete encasement.

**NO TEXT ON THIS PAGE**

**Section 15121**  
**PIPE EXPANSION AND SEISMIC FITTINGS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following pipe expansion joints and expansion compensation devices for mechanical piping systems:

1. Metal-bellows expansion joints
2. Flexible Loops for Seismic
3. Flexible Expansion Joints for Piping
4. Alignment guides and anchors

**1.02 PERFORMANCE REQUIREMENTS**

- A. Compatibility: Products shall be suitable for piping system fluids, materials, working pressures, and temperatures.
- B. Capability: Products shall absorb 200 percent of maximum axial movement between anchors.

**1.03 SUBMITTALS**

- A. Product Data: For each type of pipe expansion joint and alignment guide indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer.
1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints.
  2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
  3. Alignment Guide Details: Detail field assembly and attachment to building structure.
  4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.
- C. Product Certificates: For each type of pipe expansion joint, signed by product manufacturer.
- D. Welding certificates.
- E. Operation and Maintenance Data: For pipe expansion joints to include in emergency, operation, and maintenance manuals.

## 1.04 QUALITY ASSURANCE

### A. Welding: Qualify procedures and personnel according to the following:

1. Steel Shapes and Plates: AWS D1.1, "Structural Welding Code - Steel."
2. Welding to Piping: ASME Boiler and Pressure Vessel Code: Section IX.

## PART 2 PRODUCTS

### 2.01 EXPANSION JOINTS

#### A. Metal-Bellows Expansion Joints: ASTM F 1120, circular-corrugated-bellows type with external tie rods.

##### 1. Manufacturers

- a. Adsko Manufacturing, LLC
- b. Badger Industries
- c. Expansion Joint Systems, Inc.
- d. Flex-Hose Co., Inc.
- e. Flexicraft Industries
- f. Flex-Pression, Ltd.
- g. Flex-Weld, Inc.
- h. Metraflex, Inc.
- i. Piping Technology & Products, Inc.
- j. Senior Flexonics, Inc.; Pathway Division
- k. Unaflex Inc.
- l. WahlcoMetroflex
- m. Or approved equal

##### 2. Metal-Bellows Expansion Joints for Steel Piping: Multiple-ply stainless-steel bellows, steel pipe end connections, and carbon-steel shroud.

##### 3. Minimum Pressure Rating: 150 psig , unless otherwise indicated.

##### 4. Configuration: Single bellows type with base, unless otherwise indicated.

##### 5. End Connections: Flanged.

#### B. Flexible Loops for Seismic

##### 1. Manufacturers

- a. Flex-Hose Co., Inc.
- b. Flexicraft Industries
- c. Flex-Pression, Ltd.
- d. Metraflex, Inc.
- e. Or approved equal

2. Flexible Hose Loops for Seismic: Manufactured assembly with two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose; with inlet and outlet elbow fittings, corrugated-metal inner hoses, and braided outer sheaths.
3. Stainless-steel hoses and double-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
4. Flexible-Hose Expansion Joints for Steel Piping: Steel fittings with 150 lb. flanged end connections.

C. Flexible Expansion Joints for Piping

1. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.
2. Flexible expansion joints fittings shall allow for seismic event of the building moving 6 inches and the ramp moving as much as 6" in the opposite direction. Total of 12 inches differential. Fittings will be utilized on fire water lines, sanitary line and a domestic water line.
3. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual approved is required.
4. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20° and 4-inches minimum expansion. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both ends of the flexible joint shall be provided with 125lb flanges.
5. All internal surfaces (wetted parts) shall be lined with minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.
6. All external surfaces shall be coated with a catalyzed coat tar epoxy conforming to the material requirements of AWWA C120.
7. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The owner shall reserve the right to inspect the manufacturer's facility expansion joints shall be FLEX-TEND as manufactured by EBAA Iron, Inc. or approved equal.

## 2.02 ALIGNMENT GUIDES

- A. Steel, factory fabricated, with bolted two-section outer cylinder and base for alignment of piping and two-section guiding spider for bolting to pipe.

### 1. Manufacturers

- a. Adsko Manufacturing, LLC.
- b. Advanced Thermal Systems, Inc.
- c. Flex-Hose Co., Inc.
- d. Flexicraft Industries
- e. Flex-Weld, Inc.
- f. Hyspan Precision Products, Inc.
- g. Metraflex, Inc.
- h. Piping Technology & Products, Inc.
- i. Senior Flexonics, Inc.; Pathway Division
- j. Or approved equal

## 2.03 MATERIALS FOR ANCHORS

- A. Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex head.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, and tension and shear capacities appropriate for application.
1. Stud: Threaded, zinc-coated carbon steel
  2. Expansion Plug: Zinc-coated steel
  3. Washer and Nut: Zinc-coated steel

## PART 3 EXECUTION

### 3.01 EXPANSION-JOINT INSTALLATION

- A. Install manufactured, nonmetallic expansion joints according to FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
- B. Install expansion joints of sizes matching size of piping in which they are installed.
- C. Install alignment guides to allow expansion and to avoid end-loading and torsional stress.

3.02 SWING CONNECTIONS

- A. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.
- B. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
- C. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.03 FLEXIBLE EXPANSION JOINTS FOR PIPING

- A. Install flexible expansion joints in accordance with manufactures recommendations.

3.04 ALIGNMENT-GUIDE INSTALLATION

- A. Install guides on piping adjoining pipe expansion joints and bends and loops.
- B. Attach guides to pipe and secure to building structure.

3.05 ANCHOR INSTALLATION

- A. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install steel anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and AWS D1.1.
- C. Install pipe anchors according to expansion-joint manufacturer's written instructions if expansion joints or compensators are indicated.

-END OF SECTION-



**NO TEXT ON THIS PAGE**

## Section 15122 METERS AND GAGES

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. This Section includes the following meters and gages for mechanical systems:

1. Thermometers
2. Gages
3. Test plugs

#### 1.02 RELATED SPECIFICATIONS

- A. Section 13921 - Electric-Drive, Centrifugal Fire Pumps, for fire-pump flowmeter systems.
- B. Section 15140 - Domestic Water Piping, for domestic and fire-protection water service meters inside the building.
- C. Section 15190 - Fuel Gas Piping, for gas meters inside the building.

#### 1.03 DEFINITIONS

- A. CR: Chlorosulfonated polyethylene synthetic rubber
- B. EPDM: Ethylene-propylene-diene terpolymer rubber

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated; include performance curves.
- B. Shop Drawings: Schedule for thermometers, gages flowmeters and thermal-energy meters indicating manufacturer's number, scale range, and location for each.
- C. Product Certificates: For each type of thermometer gage flowmeter and thermal-energy meter, signed by product manufacturer.
- D. Operation and Maintenance Data: For flowmeters and thermal-energy meters to include in emergency, operation, and maintenance manuals.

### PART 2 PRODUCTS

#### 2.01 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

- A. Manufacturers
1. Palmer - Wahl Instruments Inc.
  2. Terice, H. O. Co.

3. Weiss Instruments, Inc.
  4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
  5. Or approved equal
- B. Case: Die-cast aluminum or brass, 9 inches long.
- C. Tube: Red or blue reading, mercury or organic-liquid filled, with magnifying lens.
- D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.
- E. Window: Glass
- F. Connector: Adjustable type, 360 degrees in horizontal plane, with locking device.
- G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.
- H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

## 2.02 BIMETALLIC-ACTUATED DIAL THERMOMETERS

### A. Manufacturers

1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Ernst Gage Co.
3. Eugene Ernst Products Co.
4. Marsh Bellofram
5. Palmer - Wahl Instruments Inc.
6. REO TEMP Instrument Corporation
7. Tel-Tru Manufacturing Company
8. Weiss Instruments, Inc.
9. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
10. WIKA Instrument Corporation
11. Winters Instruments
12. Or approved equal

- B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.
- C. Case: Liquid-filled type, stainless steel with 5-inch diameter
- D. Element: Bimetal coil
- E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings
- F. Pointer: Red metal
- G. Window: Glass
- H. Ring: Stainless steel
- I. Connector: Adjustable angle type
- J. Stem: Metal, for thermowell installation and of length to suit installation
- K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range

## 2.03 THERMOWELLS

### A. Manufacturers

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Marsh Bellofram
5. Miljoco Corp.
6. Trerice, H. O. Co.
7. Weiss Instruments, Inc.
8. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
9. WIKA Instrument Corporation
10. Winters Instruments
11. Or approved equal

- B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer. Provide thermowell from same manufacturer of thermometer being used.

## 2.04 PRESSURE GAGES

### A. Manufacturers

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Eugene Ernst Products Co.
5. Palmer - Wahl Instruments Inc.
6. Trerice, H. O. Co.
7. Weiss Instruments, Inc.
8. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
9. WIKA Instrument Corporation
10. Winters Instruments
11. Or approved equal

### B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Liquid-filled type, drawn steel or cast aluminum, 6-inch diameter
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated
4. Movement: Mechanical, with link to pressure element and connection to pointer
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings
6. Pointer: Red metal

7. Window: Glass
  8. Ring: Stainless steel
  9. Accuracy: Grade A, plus or minus 1 percent of middle half scale
  10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure
  11. Range for Fluids under Pressure: Two times operating pressure
- C. Remote-Mounting, Dial-Type Pressure Gages: ASME B40.100, indicating-dial type
1. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch diameter with holes for panel mounting
  2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated
  3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated
  4. Movement: Mechanical, with link to pressure element and connection to pointer
  5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings
  6. Pointer: Red metal
  7. Window: Glass
  8. Ring: Stainless steel
  9. Accuracy: Grade A, plus or minus 1 percent of middle half scale
  10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure
  11. Range for Fluids under Pressure: Two times operating pressure
- D. Pressure-Gage Fittings
1. Valves: NPS 1/4 brass or stainless-steel needle type
  2. Syphons: NPS 1/4 coil of brass tubing with threaded ends
  3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure

## 2.05 TEST PLUGS

## A. Manufacturers

1. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Co.
6. Trerice, H. O. Co.
7. Watts Industries, Inc.; Water Products Div.
8. Or approved equal

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

E. Test Kit: Furnish two test kits containing one pressure gage and adaptor, two thermometers, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
4. Carrying case shall have formed instrument padding.

## 2.06 FLOW INDICATORS

### A. Manufacturers

1. Brooks Instrument Div.; Emerson Electric Co.
2. Dwyer Instruments, Inc.
3. Ernst Gage Co.
4. Eugene Ernst Products Co.
5. McCrometer, Inc.
6. OPW Engineered Systems; Dover Corp.
7. Penberthy, Inc.
8. Or approved equal

B. Description: Instrument for installation in piping systems for visual verification of flow

C. Construction: Bronze or stainless-steel body; with sight glass and indicator, and threaded or flanged ends

D. Pressure Rating: 125 psig

E. Temperature Rating: 200 deg.

F. End Connections for NPS 2 and Smaller: Threaded

G. End Connections for NPS 2-1/2 and Larger: Flanged

## PART 3 EXECUTION

### 3.01 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each thermal storage tank

B. Install liquid-filled-case-type, bimetallic-actuated dial thermometers at suction and discharge of each pump.

C. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: with 2-degree scale divisions 30 to 240 deg F, with 2-degree scale divisions.
2. Domestic Hot Water Circulating: 30 to 180 deg F, with 2-degree scale divisions with 2-degree scale divisions.
3. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions with 2-degree scale divisions.



4. Install thermometers as indicated on all Plumbing Drawings.

### 3.02 GAGE APPLICATIONS

- A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.
- B. Install liquid-filled-case-type pressure gages at suction and discharge of each pump.

### 3.03 INSTALLATIONS

- A. Install direct-mounting thermometers and adjust vertical and tilted positions.
- B. Install remote-mounting dial thermometers on panel, with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.
- C. Install thermowells with socket extending a minimum of 2 inches into fluid one-third of diameter of pipe and in vertical position in piping tees where thermometers are indicated.
- D. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.
- E. Install remote-mounting pressure gages on panel.
- F. Install needle-valve and snubber fitting in piping for each pressure gage for fluids
- G. Install test plugs in tees in piping.
- H. Install flow indicators, in accessible positions for easy viewing, in piping systems.
- I. Install permanent indicators on walls or brackets in accessible and readable positions.
- J. Install connection fittings for attachment to portable indicators in accessible locations.

### 3.04 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility

-END OF SECTION-

**Section 15140**  
**DOMESTIC WATER PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes domestic water piping and water meters inside the building.
- B. Water meters will be furnished by utility company for installation by Contractor.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15122 - Meters and Gages, for thermometers, pressure gages, and fittings.
- B. Section 15430 - Plumbing Specialties, for water distribution piping specialties.

**1.03 GENERAL REQUIREMENTS**

- A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

**1.04 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings and water meters.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

**1.05 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

## 2.02 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

## 2.03 VALVES

- A. Bronze and cast-iron, general-duty valves are specified in Section 15410 - Plumbing Valves.
- B. Balancing and drain valves are specified in Section 15430 - Plumbing Specialties.

## 2.04 WATER METERS

- A. Water meters shall be in accordance with City of New York Department of Environmental Protection.

## PART 3 EXECUTION

## 3.01 EXCAVATION

- A. Excavating, trenching, and backfilling are specified in Section 02316 - Excavation and Section 02317 - Backfilling.

## 3.02 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Domestic Water Piping on Service Side of Water Meter inside the Building: Use the following piping materials for each size range:
  - 1. NPS 3/4" to NPS 4": Hard copper tube, Type L; copper pressure fittings; and soldered joints.

### 3.03 VALVE APPLICATIONS

- A. Drawings in general indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use cast-iron gate valves with flanged ends for piping NPS 2-1/2 and larger.
  - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron globe valves with flanged ends for piping NPS 2-1/2 and larger.
  - 3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
  - 4. Drain Duty: Hose-end drain valves.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Balancing valves are specified in Section 15430 - Plumbing Specialties.
- E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Section 15430 - Plumbing Specialties.

### 3.04 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Section 15050 - Basic Mechanical Materials and Methods.
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."

- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Section 15050 - Basic Mechanical Materials and Methods.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Section 15050 - Basic Mechanical Materials and Methods.
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Section 15122 - Meters and Gages, and drain valves and strainers are specified in Section 15430 - Plumbing Specialties.
- F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

### 3.05 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Section 15050 - Basic Mechanical Materials and Methods.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.06 WATER METER INSTALLATION

- A. Rough-in domestic water piping for water meter installation and install water meters according to utility company's requirements.
- B. Install water meters according to AWWA M6 and in accordance with New York City Department of Environmental Protection requirements.
  - 1. Install turbine-type water meters with shutoff valve on water-meter inlet and outlet and in accordance with New York City Department of Environmental Protection requirements.
  - 2. Install compound-type water meters with shutoff valves on water-meter inlet and outlet. Support meters, valves, and piping in accordance with New York City Department of Environmental Protection requirements.
  - 3. Install remote registration system according to standards of utility and in accordance with New York City Department of Environmental Protection requirements.

## 3.07 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Section 15071 - Vibration Control.
- B. Pipe hanger and support devices are specified in Section 15060 - Hangers and Supports. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42 clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers
    - c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers
- C. Install supports according to Section 15060 - Hangers and Supports.
- D. Support vertical piping and tubing at base and at each floor.
- E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod
  - 2. NPS 1-1/2: 108 inches with 3/8-inch rod
  - 3. NPS 2: 10 feet with 3/8-inch rod
  - 4. NPS 2-1/2: 11 feet with 1/2-inch rod
  - 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod
  - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod
  - 7. NPS 6: 12 feet with 3/4-inch rod
- F. Install supports for vertical steel piping every 15 feet.
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod
  - 4. NPS 2-1/2: 108 inches with 1/2-inch rod
  - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod
  - 6. NPS 6: 10 feet with 5/8-inch rod
- H. Install supports for vertical copper tubing every 10 feet.

- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.08 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
  1. Booster Pumps: Cold-water suction and discharge piping
  2. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections
  3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 15410 - Plumbing Fixtures and Trim.
  4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.09 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
  1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
  3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
  - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.



6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.11 CLEANING

#### A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - (1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - (2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

-END OF SECTION-

**Section 15141  
DISINFECTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Disinfection of all pipelines, and equipment which are to store, handle or carry potable water. Furnish all labor, water, chemicals and equipment, including taps, corporation stops, temporary pumps and other items necessary to perform the Work, except as otherwise specified. Water for the initial disinfection procedure will be furnished by City of New York.

**1.02 REFERENCES**

- A. AWWA C651 - Disinfecting Water Main
- B. New York Department of Environmental Protection (NYCDEP) Bureau of Water Supply Standard Water Main Specifications
- C. New York City Building Code

**1.03 QUALITY ASSURANCE**

- A. Disinfection Standards: Disinfect in accordance with AWWA C651 for water mains, except as modified herein.
- B. Local Requirements: Disinfection procedures for new water mains shall also conform to the requirements of the New York City Building Code, Section P107.27, "Disinfection of Potable Water Systems," and Section P107.8, "Water Supply Tanks," respectively, as well as the requirements in the NYCDEP Bureau of Water Supply Standard Water Main Specifications, except as modified herein

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION**

**3.01 APPLICATION**

- A. Disinfect pumps, hydrants, and other water handling equipment items that are part of the potable water distribution system in the same manner as described herein for the pipelines.
- B. Disinfection Procedures for Piping: Flush pipelines with clean water before disinfecting. Disinfect by the continuous feed method, as specified in AWWA C651, using sodium hypochlorite solution. Then add chlorinated water containing not less than 50 mg/l free available chlorine followed by clean water at one end of the section being disinfected and discharged at the far end.

1. Add the chlorinated water until the water coming from each downstream blowoff has a residual of not less than 25 mg/l of chlorine.
  2. Close the pipelines and allow the solution to remain in the lines for at least 24 hours. Recheck the chlorine residual in the pipeline. If the free chlorine residual is less than 10 mg/l after 24 hours, disinfect the pipelines again with more concentrated chlorinated water.
  3. After meeting the previous requirements in this subsection and after a 24-hour holding period, thoroughly flush out the pipelines and equipment and fill with clean water. Do not permit flushing water to discharge into existing water mains.
  4. Do not discharge flushing water to sanitary or storm sewers without permission of the NYCDEP. Where necessary, contact Federal, State and local regulatory agencies to determine special provisions for the disposal of heavily chlorinated water.
  5. When new potable water pipelines are to be connected to an existing water distribution system, the connecting piping shall be disinfected and tested in accordance with the procedure set forth in Section 9.1 or Section 9.2, as applicable, of AWWA C651 and in accordance with NYCDEP Bureau of Water Supply requirements.
- C. Disinfection Procedures for Tanks: Disinfect potable water storage tanks and equipment in accordance with AWWA C652, Method 2 or 3, using sodium hypochlorite.
1. In Method 2, spray method, spray the entire interior surface of the tank with chlorinated water containing 200 mg/l of available chlorine. After spraying, allow the tank to stand at least two hours before filling with fresh water. After disinfection, allow the tanks and equipment to overflow until the chlorine residual is approximately 2 mg/l.
  2. In Method 3, add sodium hypochlorite and water to the tank in amounts such that the solution contains 50 mg/l of available chlorine when the tank is filled to approximately 5 percent of the total storage volume. Hold the solution in the tank for not less than 6 hours, then fill the tank to the overflow level and let stand for not less than 24 hours. At completion, purge the highly chlorinated water from the drain piping. After the 24-hour period has elapsed, the free-chlorine residual shall be not less than 2 mg/l.
- D. Water Supply: Water for the first filling, disinfection and flushing procedure of each pipeline, tank and piece of equipment will be furnished by the City of New York, at no cost to the Contractor, from the nearest hydrant or other source. The Contractor shall provide all necessary apparatus to convey the water to the point of use and perform the disinfection procedure. If the water in the pipelines or storage facility fails the bacteriological tests, water for subsequent disinfection procedures

shall be provided by the Contractor. If agreeable to the City or New York, water for the subsequent disinfection procedures may be furnished by the City of New York but shall be metered, and the Contractor shall credit the City of New York for the cost of water used for the subsequent procedures.

3.02 VERIFICATION OF DISINFECTION

- A. Final Samples: Bacteriological samples will be taken and tested by the Contractor as required by the New York City Department of Health. If the samples are not satisfactory, repeat the entire disinfection procedure.
  - 1. Submit test reports to the Commissioner for review and approval.
  - 2. Assume the expense of taking and testing additional samples until satisfactory samples are obtained.
  - 3. Assume the expense of all water for subsequent fillings of the pipelines, tanks and equipment.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15150**  
**SANITARY WASTE, INDUSTRIAL WASTE AND VENT PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes furnishing and installing sanitary waste and vent pipe, fittings, accessories, specialties as shown, specified or required for a complete installation and satisfactory operation. Provide pipe and fittings of new materials, protected from dirt, moisture and mechanical damage.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15430 - Plumbing Specialties, for storm drainage piping system specialties.

**1.03 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water
  - 2. Sanitary Sewer, Force-Main Piping: 50 psig

**1.05 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

## 2.02 CAST-IRON SOIL PIPING

- A. Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class.
  - 1. Gaskets: ASTM C 564, rubber
- B. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301
  - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
    - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve
      - (1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands
      - (2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands

## 2.03 STEEL PIPING

- A. Steel Pipe: ASTM A 53, Type Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
  - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
  - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends
  - 3. Cast-Iron, Threaded, Drainage Fittings: ASME B16.12, galvanized
  - 4. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern
  - 5. Cast-Iron Flanges: ASME B16.1, Class 125
  - 6. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized

7. Steel-Piping, Expansion Joints: Compound, galvanized steel fitting with telescoping body and slip-pipe section. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe section, and flanged ends.

#### 2.04 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
  1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

#### 2.05 DUCTILE IRON PIPING AND FITTINGS

- A. Grooved-End, Ductile-Iron Pipe: AWWA C151, with factory- or field-formed, radius-cut-grooved ends according to AWWA C606.
  1. Grooved-Joint Piping Systems:
    - a. Manufacturer: Victaulic Co. of America or approved equal.
    - b. Grooved-End-Pipe Couplings: AWWA C606, gasketed fitting matching ductile-iron-pipe OD. Include ductile-iron housing with keys matching ductile-iron-pipe and fitting grooves, pressure responsive synthetic rubber gasket of a FlushSeal design with center leg, and steel bolts and nuts. Victaulic Style 31 or approved equal.

### PART 3 EXECUTION

#### 3.01 EXCAVATION

- A. Refer to Section 02316 - Excavation and 02317 - Backfilling for excavating, trenching, and backfilling.

#### 3.02 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.



- C. Aboveground, Soil, Industrial Waste, Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 1-1/4 and NPS 2: Galvanized Steel pipe; cast-iron, galvanized threaded drainage fittings; and threaded joints
  - 2. NPS 3 to NPS 10: Hubless, cast-iron soil piping and the following:
    - a. Couplings: Heavy-duty, Type 304, stainless steel
- D. Underground and Under pier, Soil, Waste, Industrial Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 2 to NPS 10: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

### 3.03 PIPING INSTALLATION

- A. Refer to Section 02503 – Installation of Buried Pipelines for Project-site sanitary sewer piping.
- B. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping installation.
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Section 15050 - Basic Mechanical Materials and Methods for sleeves and mechanical sleeve seals.
- F. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Section 15050 - Basic Mechanical Materials and Methods for wall penetration systems.
- G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if

pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Sanitary Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger
  - 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack
- K. Install force mains at elevations indicated.
- L. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:
  - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  - 2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
  - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- M. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.04 JOINT CONSTRUCTION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping joint construction.

- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.05 VALVE INSTALLATION

- A. Refer to Sections 15110 - Plumbing Valves and 15112 - Valves Smaller than 4 Inches for valves for general-duty valves.

- B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Use gate or full-port ball valve for piping NPS 2 and smaller.
2. Use gate valve for piping NPS 2-1/2 and larger.

- C. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.

### 3.06 HANGER AND SUPPORT INSTALLATION

- A. Refer to Section 15071 - Vibration Control.

- B. Refer to Section 15060 - Hangers and Supports for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
  - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

- C. Install supports according to Section 15060 - Hangers and Supports.

- D. Support vertical piping and tubing at base and at each floor.

- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod
  - 2. NPS 3: 60 inches with 1/2-inch rod
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod
  - 4. NPS 6: 60 inches with 3/4-inch rod
  - 5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod
  - 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 84 inches with 3/8-inch rod
  - 2. NPS 1-1/2: 108 inches with 3/8-inch rod
  - 3. NPS 2: 10 feet with 3/8-inch rod
  - 4. NPS 2-1/2: 11 feet with 1/2-inch rod
  - 5. NPS 3: 12 feet with 1/2-inch rod
  - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod
  - 7. NPS 6: 12 feet with 3/4-inch rod
  - 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod
- H. Install supports for vertical steel piping every 15 feet.
- I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 72 inches with 3/8-inch rod
  - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod
  - 3. NPS 2-1/2: 108 inches with 1/2-inch rod
  - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod
  - 5. NPS 6: 10 feet with 5/8-inch rod
  - 6. NPS 8: 10 feet with 3/4-inch rod
- J. Install supports for vertical copper tubing every 10 feet.
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.07 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

## C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 15410 - Plumbing Fixtures and Trim.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 15430 - Plumbing Specialties.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

## D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main or sanitary manhole
2. Sewage Pumps: To sewage pump discharge

## 3.08 FIELD QUALITY CONTROL

## A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

## B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

## C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

## D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  4. Prepare reports for tests and required corrective action.

### 3.09 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

**-END OF SECTION-**

**Section 15160**  
**STORM DRAINAGE PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes furnishing and installing storm drain pipe, fittings, accessories, specialties as shown, specified or required for a complete installation and satisfactory operation. Provide pipe and fittings of new materials, protected from dirt, moisture and mechanical damage.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15430 - Plumbing Specialties, for storm drainage piping system specialties.

**1.03 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.04 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.



## 2.02 CAST-IRON SOIL PIPING

- A. Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.
  - 1. Gaskets: ASTM C 564, rubber
- B. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301
  - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.
    - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
      - (1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands
      - (2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands

## 2.03 STEEL PIPING

- A. Steel Pipe: ASTM A 53, Type Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
  - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method
  - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends
  - 3. Cast-Iron, Threaded, Drainage Fittings: ASME B16.12, galvanized
  - 4. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern
  - 5. Cast-Iron Flanges: ASME B16.1, Class 125
  - 6. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized
  - 7. Steel-Piping, Expansion Joints: Compound, galvanized steel fitting with telescoping body and slip-pipe section. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe section, and flanged ends.

## 2.04 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

## PART 3 EXECUTION

### 3.01 EXCAVATION

- A. Refer to Section 02316 - Excavation and Section 02317 - Backfilling for excavating, trenching, and backfilling.

### 3.02 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground Storm Drainage Piping: Use the following piping materials for each size range:
  - 1. NPS 2 to NPS 15: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 304, stainless steel
- D. Underground and Under Pier Storm Drainage Piping: Use the following piping materials for each size range:
  - 1. NPS 3 and NPS 15: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints

### 3.03 PIPING INSTALLATION

- A. Refer to Section 02503 - Installation of Buried Pipelines for Project site storm sewer and drainage piping.
- B. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping installation.

- C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.
- D. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- E. Underground, Ductile-Iron, Force-Main Piping: Comply with AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
  - 1. Encase piping with PE film according to ASTM A 674 or AWWA C105.
- F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Section 15050 - Basic Mechanical Materials and Methods for sleeves and mechanical sleeve seals.
- G. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Section 15050 - Basic Mechanical Materials and Methods for wall penetration systems.
- H. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- I. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- J. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- K. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Horizontal Storm-Drainage Piping: 1 percent downward in direction of flow.
- L. Install force mains at elevations indicated.
- M. Install engineered controlled-flow storm drainage piping in locations indicated.

- N. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.04 JOINT CONSTRUCTION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.05 VALVE INSTALLATION

- A. Refer to Section 15110 - Plumbing Valves for general-duty valves.
- B. Shutoff Valves: Install shutoff valve on each sump pump discharge.
  - 1. Use gate or full-port ball valve for piping NPS 2 and smaller.
  - 2. Use gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, downstream from shutoff valve, on each sump pump discharge.
- D. Backwater Valves: Install backwater valves in piping subject to backlog.
  - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
  - 2. Install backwater valves in accessible locations.
  - 3. Refer to Section 15430 - Plumbing Specialties for backwater valves.

### 3.06 HANGER AND SUPPORT INSTALLATION

- A. Refer to Section 15060 - Hangers and Supports for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer than 100 Feet, if indicated: MSS Type 49, spring cushion rolls.
  3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Section 15060 - Hangers and Supports.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod
  2. NPS 3: 60 inches with 1/2-inch rod
  3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod
  4. NPS 6: 60 inches with 3/4-inch rod
  5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod
  6. NPS 15: 60 inches with 1-inch rod
  7. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 84 inches with 3/8-inch rod
  2. NPS 1-1/2: 108 inches with 3/8-inch rod
  3. NPS 2: 10 feet with 3/8-inch rod
  4. NPS 2-1/2: 11 feet with 1/2-inch rod
  5. NPS 3: 12 feet with 1/2-inch rod
  6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod
  7. NPS 6: 12 feet with 3/4-inch rod
  8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod
- H. Install supports for vertical steel piping every 15 feet.

- I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 72 inches with 3/8-inch rod
  - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod
  - 3. NPS 2-1/2: 108 inches with 1/2-inch rod
  - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod
  - 5. NPS 6: 10 feet with 5/8-inch rod
  - 6. NPS 8: 10 feet with 3/4-inch rod
- J. Install supports for vertical copper tubing every 10 feet.
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.07 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
  - 1. Storm Sewer: To storm manhole
  - 2. Sump Pumps: To sump pump discharge

### 3.08 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.09 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

**-END OF SECTION-**



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**Section 15184**  
**REFRIGERATION PIPING AND SPECIALTIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Refrigeration piping and piping specialties used for air conditioning applications.

**1.02 RELATED SPECIFICATIONS**

- A. Section 07920 - Exterior Joints Sealants
- B. Section 07921 - Interior Sealants
- C. Section 15060 - Hangers and Supports
- D. Section 15076 - Piping and Equipment Identification
- E. Section 15081 - Piping Insulation
- F. Section 15670 - Condensing Units
- G. Section 15730 - Packaged Air Conditioning Units
- H. Section 15761 - Air Coils
- I. Section 16121 - Wire and Cable - 600 Volts and Below

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
- 1. ASHRAE 15 - Safety Code for Mechanical Refrigeration
  - 2. ASME - Boiler and Pressure Vessel Code SEC IX - Welding and Brazing Qualifications
  - 3. ASME B31.5 - Refrigeration Piping
  - 4. ASME B31.9 - Building Services Piping
  - 5. AWS A5.8 - Brazing Filler Metal
  - 6. AWS BRH - Brazing Handbook
  - 7. ARI 760 - Solenoid Valves for Use with Volatile Refrigerants

**1.04 ELECTRICAL REQUIREMENTS**

- A. Design the solenoid and regulating valves for use on a nominal 120 volts, single phase, 60 hertz electrical service.

**1.05 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.

- B. Product Data: Provide the manufacturer product data for each type of valve and for each type refrigerant piping specialty specified.
- C. Shop Drawings: Submit shop drawings showing the layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show the interface and spatial relationships between piping and proximity to equipment.
- D. Brazer's Certification: Submit signed qualification certificates certifying that brazers comply with the requirements specified under "Quality Assurance".
- E. Maintenance Data: - Submit maintenance data for refrigerant valves and piping specialties, for inclusion in the Operating and Maintenance Manual specified in Section 01831.

#### 1.06 QUALITY ASSURANCE

- A. Welding Materials and Procedures: Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Conform work to ANSI/ASME B31.9 as applicable.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, and store piping and specialties in shipping containers with labeling in place.
- B. Protection: Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Refrigerant Valves and Specialties
  - 1. Alco Controls Div, Emerson Electric
  - 2. Danfoss Electronics, Inc.
  - 3. Eaton Corporation, Control Div.
  - 4. Henry Valve Company
  - 5. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division
  - 6. Sporlan Valve Company
  - 7. Or approved equal

## 2.02 MATERIALS

### A. Copper Pipe and Fittings

1. Small Copper Piping: For copper pipe 3 inches in diameter and smaller provide Type K seamless, round, hard drawn copper tubing that meets ASTM B88 requirements. Provide tube sizes, dimensions and wall thickness conforming to ASTM B88, Table 1 for Type K tubing, unless otherwise specified. Provide nominal lengths of hard copper tubing in straight lengths of approximately 20 feet, unless otherwise specified.
  - a. Fittings: For copper tubing, use solder joint or flared end type fittings, as specified. No bending of hard copper tubing will be permitted, unless otherwise specified; make all bends and connections with suitable fittings.
    - (1) Provide flared tube fittings meeting the requirements of the SAE Hydraulic Tube Fittings standard. After flaring anneal the joints before assembly. Flared fittings shall be of brass half-hard bar stock, ASTM B 16 (SAE 72) or of brass forging, ASTM B 124, Alloy Number 2 (SAE 88). Assembly couplings and fittings to prevent oversteering the tubing. Where required, use anti-seize lubricating compound to prevent galling and to facilitate assembly.
    - (2) Solder Joint Fittings: Provide ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and copper alloy fittings. Braze solder joint fittings and tubing in conformity with the specifications of Section 3 of the CABRA Copper Tube Handbook. Brazing alloy shall be copper-phosphorus alloy, Class BCuP-5, as specified by American Welding Society Spec. AWS A5.8.
  - b. Joints: Provide threaded or ASTM B32 lead-free soldered joints.
2. Large Copper Piping: For copper pipe larger than 3 inches in diameter, provide regular seamless copper pipe that meets the ASTM B42 requirements.
  - a. Fittings: Provide solder type fittings of the same materials as the pipe.
  - b. Joints: Use threaded or brazed joints.
3. Potable Water Piping: Use ASTM B32 alloy Grade 95TA (95 percent tin and 5 percent antimony) solder for piping carrying potable water.
4. Unacceptable Uses: Do not use copper pipe with soldered joints for transporting fuel oil or other flammable or toxic liquid inside building.

**B. Threadless Copper Pipe and Fittings**

1. Provide hard drawn threadless copper pipe, standard pipe size pipe conforming to ASTM B302 furnished in 20 foot lengths. Limit maximum internal working pressure to 200 psi as computed using the Code for Pressure Piping, ASME B31.1.
2. Provide threadless bronze fittings with physical requirements meeting ASTM B62 for lines 2 inches and smaller, and ASTM B61 for lines over 2 inches.
3. Assemble threadless copper pipe ("TP") with threadless bronze fittings braze together with the copper-silver-phosphorus type of brazing alloy to form a uniform, tight joint. The alloy shall be Class BCuP-5, in accordance with American Welding Society Spec. AWS A5.8.
4. Follow the brazing procedure specifications of the Copper and Brass Research Association (CABRA).

**C. Valves: Provide complete valve assemblies, UL-listed, and designed to conform to ARI 760.**

1. Globe: 450 psig maximum operating pressure, 275 degrees F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Provide valves capable of being repacked under pressure. Provide straight through or angle pattern valves, with solder-end connections.
2. Check Valves - Smaller Than 7/8 inch: 500 psig maximum operating pressure, 300 degrees F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Provide straight through pattern valves, with solder-end connections.
3. Check Valves - 7/8 inch and Larger: 450 psig maximum operating pressure, 300 degrees F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Provide straight through or angle pattern valves, with solder-end connections.
4. Solenoid Valves: 240 degrees F temperature rating, 500 psig working pressure; packless construction, forged brass, with Teflon valve seat and stainless steel core, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2-inch conduit adapter, and normally closed moisture resisting holding coil.

5. Evaporator Pressure Regulating Valves: Pilot-operated, forged brass or cast bronze; complete with pilot operator, stainless steel bottom spring, pressure gauge tappings, standard coil; and wrought copper fittings for solder end connections.
  6. Thermal Expansion Valves: Straight through or angle design, with solder-end connections, thermostatic adjustable, modulating type; size as required for specific evaporator requirements, and factory set for proper evaporator superheat requirements. Provide packless type valves with a forged brass body and corrosion resistant brass and stainless steel trim, complete with sensing bulb, a distributor having a side connection for hot gas bypass line, external superheat adjustments, and an external equalizer line.
  7. Hot Gas Bypass Valve: Adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.
- D. Refrigeration Piping Specialties: Provide complete refrigeration piping specialty assemblies designed to conform to ARI 760, and UL-listed.
1. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
  2. Moisture/Liquid Indicators: 500 psig maximum operation pressure, 200 degrees F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, moisture sensing element which changes color when an unsafe moisture level exists in the system, and solder-end connections.
  3. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, gasketed ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
    - a. High capacity desiccant sieves to provide micronic filtration and extra drying capacity.
  4. Suction Line Filter-Drier: 350 psig maximum operation pressure, 225 degrees F maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Permanent filter element with a molded felt core surrounded by a desiccant, for removal of acids and moisture from refrigerant vapor.
  5. Suction Line Filters: 500 psig maximum operation pressure; "T" type corrosion resistant plated steel shell, flange ring, and spring, gasketed ductile iron cover plate with steel capscrews, and wrought copper fittings for solder

end connections. Furnish complete with replaceable filter core kit, including gaskets, as follows:

- a. High capacity filter kit to provide micronic filtration.
6. Flanged Unions: 400 psig maximum working pressure, 330 degrees F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions of forged steel, and for 2-1/8 inch through 3-1/8 inch of ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Provide a factory-applied rust-resistant coating for flanges and bolts.
7. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

## 2.03 IDENTIFICATION

- A. Provide piping, equipment and valve identification in accordance with the requirements of Section 15076 – Piping and Equipment Identification.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine rough-in for refrigeration piping systems to verify actual locations of piping connections prior to installation.

### 3.02 INSTALLATION

- A. Piping: Install refrigeration piping in accordance with ASHRAE Standard 15.
  1. Install piping in as short and direct arrangement as possible to minimize pressure drop.
  2. Install piping for minimum number of joints using as few elbows and other fitting as possible.
  3. Arrange piping to allow normal inspection and servicing of compressor and other equipment.
  4. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit the installation of full thickness insulation.
  5. Insulate the refrigerant piping in accordance with the requirements of Section 15081 – Piping Insulation.

6. Install branch tie-in lines to parallel compressors with an equal length, and pipe identically and symmetrically.
  7. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
  8. Slope refrigeration piping as follows:
    - a. Install horizontal hot gas discharge piping with 1/2-inch per 10 feet downward slope away from the compressor.
    - b. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
    - c. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
    - d. Liquid lines may be installed level.
  9. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
  10. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
  11. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- B. Valves and Specialties: Install valves and specialties in accessible locations to allow for servicing and inspection, and in accordance with the manufacturer's instructions.
1. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.
  2. Install a full sized, 3-valve bypass around each drier.
  3. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
    - a. Electrical wiring for solenoid valves to be furnished in accordance with the requirements of Section 16121 - Wires and Cables - 600 Volts and Below.



4. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
    - a. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
    - b. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
    - c. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount the bulb in a trap or at the bottom of the line.
    - d. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
  5. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.
  6. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.
  7. Install moisture/liquid indicators in liquid lines between filter/driers and upstream of thermostatic expansion valves and in liquid line to receiver.
    - a. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.
  8. Install filter/driers upstream of solenoid and expansion valves.
  9. Install unions to allow for removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.
  10. Install flexible connectors at the inlet and discharge connection of compressors and condensers.
- C. Hangers and Supports: Hangers, supports, and anchors are to be furnished in accordance with the requirements of Section 15060 – Hangers and Supports.
- D. Pipe Joint Construction: Provide brazed joints complying with the procedures contained in the AWS "Brazing Manual."
1. **WARNING:** Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes and provide adequate ventilation.

2. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.
  3. Fill the pipe and fittings during brazing, with an inert gas i.e., nitrogen or carbon dioxide to prevent formation of scale.
  4. Heat joints using oxy-acetylene torch. Heat to the proper and uniform brazing temperature.
- E. Equipment Connections: The Contract Drawings indicate the general arrangement of piping, fittings, and specialties. Install piping adjacent to machines to allow servicing and maintenance.
- F. System Charging: Charge the system using the following procedure:
1. Install core in filter dryer after leak test but before evacuation.
  2. Evacuate refrigerant system with vacuum pump, until a temperature of 35 degrees F is indicated on the vacuum dehydration indicator.
  3. During evacuation, apply heat to pockets, elbows, and low spots in the piping.
  4. Maintain a vacuum on the system for minimum of 5 hours after closing the valve between the vacuum pump and the system.
  5. Break the vacuum with refrigerant gas, and allow the pressure to build up to 2 psi.
  6. Complete charging of system, using a new filter dryer core in the charging line. Provide full operating charge.

### 3.03 FIELD QUALITY CONTROL

- A. Inspection: Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.
- B. Repairs: Repair leaking joints using new materials, and retest for leaks.
- C. Manufacturer's Field Service: Train City of New York maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigeration piping valves and refrigeration piping specialties, as specified in Section 01821 - Training.

3.04 ADJUSTING AND CLEANING

- A. General: Verify actual evaporator applications and operating conditions, and adjust the thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Adjust Controls and Safeties: Replace damaged or malfunctioning controls and equipment with new materials and products.
- C. Procedures: Before installation of copper tubing, clean the tubing and fittings using the following cleaning procedure:
  - 1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
  - 2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until the cloth is not discolored by dirt.
  - 3. Draw a clean, lintless cloth, first saturated with compressor oil and then squeezed dry, through the tube or pipe to remove any remaining lint. Inspect the tube or pipe visually for remaining dirt and lint.
  - 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

-END OF SECTION-

**Section 15190**  
**FUEL GAS PIPING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes piping, specialties, and accessories for natural gas systems within building and to gas meters.
- B. This Section includes piping, specialties, and accessories for natural gas systems within building and to point indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15122 – Meters and Gages for pressure gages
- B. Section 15060 – Hangers and Supports

**1.03 SYSTEM PERFORMANCE REQUIREMENTS**

- A. Minimum Working-Pressure Ratings: Except where otherwise indicated, minimum pressure requirements are as follows:
  - 1. Low-Pressure Natural Gas Piping: 2 psig
  - 2. Medium-Pressure Natural Gas Piping: 10 psig
- B. Approximate values of natural gas supplied for these systems are as follows:
  - 1. Heating Value: 1000 Btu/cu.ft.
  - 2. Specific Gravity: 0.6
  - 3. Service Line Pressure: 3 psig

**1.04 SUBMITTALS**

- A. Product Data for each type of natural gas specialty and special-duty valve. Include pressure rating, rated capacity, and settings of selected models.
- B. Coordination Drawings for natural gas piping, including required clearances and relationship to other services for same work areas.
- C. Test reports specified in "Field Quality Control" Article in Part 3.
- D. Maintenance data for natural gas specialties and special-duty valves to include in the operation and maintenance manual specified in Section 01831 – Operation and Maintenance Manuals.

## 1.05 QUALITY ASSURANCE

- A. Comply with NFPA 54, "National Fuel Gas Code," for gas piping materials and components; installations; and inspecting, testing, and purging.
- B. New York City Plumbing Code, Subchapter 16, Plumbing and Gas Piping and Reference Standards RS-16 Plumbing and Gas Piping.
- C. Comply with the rules and regulations of the Gas Company, New York City Building Department and with the latest regulations of the Administrative Code of the City of New York.
- D. When welding is to be performed as part of the work covered in this specification, the Contractor, before assigning any welder for this work, shall provide the Commissioner with the names of welders to be employed for this work. Welders installing gas piping at any pressure shall be qualified for all pipe sizes, wall thicknesses, and all positions in accordance with the latest editions of either API 1104 or ASME Section IX Boiler and Pressure Vessel Code and be re-qualified on an annual basis. The qualification testing shall be performed by an agency listed with the Department of Buildings, and the inspector, that verifies the welder's qualifications, shall have a minimum radiography qualification of Level II in accordance with the American Society of Non-Destructive Testing Recommended Practice Document No. SNT-TC-IA, Supplement A. Copies of the certified welder qualification reports shall be maintained by the responsible welding contractor and shall be submitted to the Commissioner.
- E. All welding of gas piping shall be in full compliance with the latest editions of API 1104 and ASME Section IX Boiler and Pressure Vessel Code. Whenever welding operations are performed, the services of a full time certified inspector or certified technician shall be retained by the Commissioner to ensure said compliance. Certified inspectors and certified technicians shall be qualified to perform visual inspections and shall have a minimum radiography qualification of Level II in accordance with the American Society of Non-Destructive Testing Recommended Practice Document No. SNT-TC-IA, Supplement A. The certified inspector or certified technician shall also be responsible for Controlled Inspection sign off upon completion of the work.
- F. The Project Officer shall coordinate with Commissioner to assure compliance during all phases of the work.
- G. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated control devices.
- H. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

- I. Listing and Labeling: Provide equipment and accessories specified in this Section that are listed and labeled:
  - 1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- J. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of natural gas piping equipment, specialties, and accessories and are based on specific types and models indicated. Other manufacturers' equipment and components with equal performance characteristics may be considered. Refer to Section 01631 - Equivalent Materials and Equipment.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

#### 1.07 SEQUENCING AND SCHEDULING

- A. Notification of Interruption of Service: Notify each affected user when gas supply will be turned off.
- B. Work Interruptions: Leave gas piping systems in safe condition when interruptions in work occur during repairs or alterations to existing gas piping systems.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Gas piping inside the building shall be standard weight (Schedule 40) black steel pipe, outside the building shall be extra heavy, Schedule 80 black steel pipe. Gas control, vent and relief piping shall be extra heavy, schedule 80 black steel pipe. Steel pipe shall be seamless or welded made in accordance with the Current Edition of the ASTM A53 Specification.
  - 1. In no case shall any gas pipe be less than 3/4". The sizes of pipe indicate nominal pipe size.
  - 2. Gas distribution piping for systems operating at 1/2 PSIG or less shall be in accordance with New York City Department of Buildings requirements and ANSI Z223.1-1974 (NFPA-54), National Fuel Code (as modified by the New York City Building Code).

3. Materials used in gas service and meter piping systems shall be in accordance with the requirements as specified by the gas utility company providing the services, and of the New York City Department of Buildings.
4. Gas service piping run underground outside the building shall be mill wrapped in accordance with the serving utility company requirements for service piping. Gas distribution piping located on the roof or exposed to the elements shall receive one coat of rust inhibitor paint, and one coat of yellow finish paint
5. Gas distribution piping run exposed outside the building shall be mill wrapped in accordance with requirement of the serving utility for their service piping.
6. Piping Joints for Gas Distribution Piping:
  - a. Piping at 1/2 psig (14" W.C.) and less:
    - (1) 4" and Smaller.....Screwed
    - (2) Over 4".....Welded
  - b. over 1/2 psig (14" W.C.) to and including 3 psig:
    - (1) Under 4" .....Screwed
    - (2) 4" and Larger.....Welded
  - c. Piping over 3 psig:
    - (1) All piping .....Welded
7. All welded gas distribution piping shall be subject to controlled inspection. Controlled inspectors shall be retained by the Commissioner. In addition to independent pressure testing of the entire system, 100% percent of all welds shall be subject to non-destructive testing (radiographed and/or subjected to ultrasonic testing). All welds shall be radiographed at the Contractor's expense if any of the samples failed. Contractor shall make all necessary repairs at no cost to the City of New York.
8. Before any work is commenced on an item of construction requiring controlled inspection, all persons responsible for such controlled inspection shall be notified in writing at least seventy two (72) hours prior to such commencement.
9. All required inspections designated for controlled inspection, shall be made and witnessed by or under the direct supervision of Commissioner, including preparation of materials, welding procedures, and finished welds.

**B. Fittings**

1. Fittings for screwed gas piping shall be 150 lbs. black malleable iron fittings, conforming to ASTM specifications A-197, latest edition.
2. Compression type fittings and steel welding fittings shall be as specified and approved by the Gas Company.
3. Steel butt welding fittings shall conform to ANSI B16.9 requirements.
4. Fitting for control, vent and relief piping shall be 300 lb. black malleable iron screwed fittings conforming to ASTM Specification A-197, latest edition.

**C. Flanges**

1. All flanges shall be steel and compatible in type and pressure ratings with mating flange and shall comply with ANSI B16.5.
2. Flanges shall be welding neck or threaded end. Slip on flanges are not permitted.
3. Where 150 pound steel flanges are bolted to Class 125 cast iron flanges, the raised face on the steel flange shall be removed.

**D. Gaskets**

1. Gaskets shall be compatible with the gas service on which they are used, without change to their chemical or physical properties.
2. Gasket shall be BLUE-GARD compressed asbestos free gaskets, style 3000 or GYLON gasketing style 3500, color: Fawn with Blue brand both as manufactured by Garlock Inc.
3. Gaskets of metal or metal-jackets, aluminum o-rings and spiral wound metal gaskets, or other materials, if approved by the Utility Company may be used.
4. Full face gaskets shall be used with all bronze and cast iron flanges.

**E. Bolts and Nuts:** Bolts and nuts shall be of best quality bolt steel with square head bolts and hexagon nuts with machine cut V-threads.**F. Thread sealant** to be used on natural gas piping shall be RectorSeal Corp No. 5, Oatey Great Blue pipe joint compound or approved equal. Thread sealant shall be a non-toxic, soft setting, slow drying sealant made from inert fillers. The joint compound shall not contain any Teflon. Teflon tapes shall not be used in natural gas lines. Teflon tapes are prone to tearing when pipes are being assembled and tightened and bits of torn tape can migrate into the fluid system, clogging valves, screens, and filters.



## 2.02 VALVES

- A. Manual Valves: Conform to standards listed or, where appropriate, to ANSI Z21.15.
- B. Gas Stops, 2-Inch NPS and Smaller: AGA-certified, bronze-body, plug type with bronze plug, ball type with chrome-plated brass ball, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal, for 2 psig or less natural gas. Include AGA stamp, flat or square head or lever handle, and threaded ends conforming to ASME B1.20.1.
- C. Gas Valves, 2-Inch NPS and Smaller: ASME B16.33, 150 psig WOG, bronze body, bronze plug, straightaway pattern, square head, tapered-plug type, with threaded ends conforming to ASME B1.20.1.
- D. Gas Valves, 2-1/2-Inch NPS and Larger: MSS SP-78, Class 125 or Class 175 WOG, non-lubricated-plug type, semisteel body, wrench operated, with flanged ends.

## 2.03 GAS SAFETY SHUT-OFF VALVES

- A. Gas safety shut-off valves shall be FM & UL listed, electric motor operated, normally closed, manual reset type. Valves shall be rising stem design with a straight through flow path with metal-to-metal seat and disc arrangement. The valve seat shall be stainless steel and the disc ductile iron. Valves shall be provided with a NEMA 4 enclosure modified for Class 1, Division II hazardous locations, be provided with an electrical terminal block and shall operate on 120 Volt, A.C., 60 Cycles, single phase. Valves shall meet ANSI Class VI leakage standard and shall be provided with a visual indicator to note the position of the valve whether "OPEN" or "SHUT".
- B. Gas safety shut-off valves 2" and smaller shall be threaded, 2 1/2" and larger shall be flanged. Flanged valves shall be provided with companion flange set by valve manufacturer.
- C. Gas safety shut-off valves shall be Maxon Corporation Series 808 for sizes 2" and smaller and Series 808-CP for valves 2-1/2" and larger. All valves shall be provided with trim package 1-1.
- D. Gas Safety Shut-Off Valves; Operating Sign
  - 1. Provide a sign made of two colors laminated engravers stock phenolic, 1/16" minimum thickness, machine engraved to expose inner core color (white). Signs to be provided with uniform margins and character size minimum 1/4" high.

## 2. Sign to read:

**"IMPORTANT"**

GAS SAFETY SHUT-OFF VALVES LOCATED IN THE NEAR-GAS-METER PIPING MUST BE MANUALLY RESET UPON ACTION OF THE GAS LEAK DETECTION SYSTEM OR LOSS OF NORMAL ELECTRICAL POWER.

## 2.04 SPECIALTY VALVES

- A. Solenoid Valves: Bronze, aluminum, or cast-iron body; 120 VAC, 60 Hz, Class B continuous-duty molded coil; UL labeled and FM approved. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position is normally closed. Include threaded ends conforming to ASME B1.20.1 for 2-inch NPS and smaller and flanged ends for 2-1/2-inch NPS and larger.
- B. Earthquake Valves: FM approved or listed in IAS Directory as complying with ANSI Z21.70 and UL listed FM approved Listed in IAS Directory as complying with ANSI Z21.70 and UL listed. Include mechanical operator.

## 2.05 PIPING SPECIALTIES

- A. Gas Pressure Regulators: ANSI Z21.18, single-stage, steel-jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 for 2-inch NPS and smaller and flanged ends for 2-1/2-inch NPS and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in cubic feet per hour of natural gas at specific gravity are as indicated.
  - 1. Service Pressure Regulators: Inlet pressure rating not less than natural gas distribution system service pressure.
  - 2. Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.
  - 3. Gas Pressure Regulator Vents: Factory- or field-installed corrosion-resistant screen in opening when not connected to vent piping.
- B. Strainers: Y pattern, full size of connecting piping. Include stainless-steel screens with 3/64-inch perforations, except where other screens are indicated.
  - 1. Pressure Rating: 125-psig minimum steam or 175-psig WOG working pressure, except where otherwise indicated
  - 2. 2-Inch NPS and Smaller: Bronze body, with threaded ends conforming to ASME B1.20.1

3. 2-1/2-Inch NPS and Larger: Cast-iron body, with flanged ends
4. Screwed screen retainer with centered blow-down and pipe plug

## 2.06 GAS METER

- A. Secure from the utility company gas meter and other ancillaries such as gas regulator that may be necessary for the complete installation of the gas system.
- B. Pulsating gas meter shall come equipped with dry contacts (2 wire Form A, single channel; 3 wire Form C, dual channel) that will enable among other things conversion of the pulse signal outputs into therms of natural gas consumed. Coordinate request for the gas meter with the TCC.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Close equipment shutoff valves before turning off gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.
- B. Comply with NFPA 54 Paragraphs "Prevention of Accidental Ignition."
- C. Include gas distribution system piping to point indicated, service pressure regulator.

### 3.02 VALVE APPLICATIONS

- A. Use gas valves for shutoff to equipment.

### 3.03 GAS METERS AND REGULATORS

- A. Con Edison will furnish the gas meters, regulators and relief valves, but they shall be installed by the Contractor.

### 3.04 GAS SAFETY SHUT-OFF VALVES

- A. Gas safety shut-off valves shall be installed within the near-gas-meter piping.
- B. Gas safety shut-off valves shall be wired to the fire alarm detection system and shall function to shut off all gas supply to the building upon.
  1. Action of the fire alarm detection system (alarm condition), and
  2. Loss of normal electrical power
- C. Valves must be manually reset upon correction of the alarm condition or restoration of electrical power.

## 3.05 PIPING INSTALLATIONS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.
- B. Drips and Sediment Traps: Install drips at points where condensate may collect. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- C. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, except where indicated to be exposed to view.
- D. Install gas piping at uniform grade of 0.1 percent slope upward toward risers.
- E. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- F. Connect branch piping from top or side of horizontal piping.
- G. Install unions in pipes 2-inch NPS and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- H. Install strainers on supply side of each control valve, gas pressure regulator, solenoid valve, and elsewhere as indicated.
- I. Install dielectric fittings (unions and flanges) with ferrous and brass or bronze end connections, separated by insulating material, where piping of dissimilar metals is joined.
- J. Install dielectric fittings (unions and flanges) with 2 ferrous end connections, separated by insulating material, at outlet from gas meter and, where indicated, for ferrous piping.
- K. Install flanges on valves, specialties, and equipment having 2-1/2-inch NPS and larger connections.
- L. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops, and pipe guides as indicated.

- M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

### 3.06 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

### 3.07 VALVE INSTALLATION

- A. Install valves in accessible locations, protected from damage. Tag valves with metal tag indicating piping supplied. Attach tag to valve with metal chain.
  - 1. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for valve tags.
  - 2. Refer to Section 15076 – Piping and Equipment Identification for valve tags.
- B. Install gas valve upstream from each gas pressure regulator. Where 2 gas pressure regulators are installed in series, valve is not required at second regulator.
- C. Install pressure relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.

### 3.08 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices.
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. 1/2-Inch NPS : Maximum span, 72 inches ; minimum rod size, 3/8 inch
  - 2. 3/4- and 1-Inch NPS : Maximum span, 96 inches ; minimum rod size, 3/8 inch
  - 3. 1-1/4-Inch NPS : Maximum span, 108 inches; minimum rod size, 3/8 inch
  - 4. 1-1/2- and 2-Inch NPS: Maximum span, 108 inches; minimum rod size, 3/8 inch
  - 5. 2-1/2- to 3-1/2-Inch NPS : Maximum span, 10 feet ; minimum rod size, 1/2 inch

- 6. 4-Inch NPS and Larger: Maximum span, 10 feet ; minimum rod size, 5/8 inch
- C. Support horizontal, corrugated stainless-steel tubing according to manufacturer's written instructions.
- D. Support vertical pipe and tube at each floor.

### 3.09 CONNECTIONS

- A. Install gas piping next to equipment and appliances using gas to allow service and maintenance.
- B. Connect gas piping to equipment with shutoff valves and unions Install union or flanged connection downstream from valve. Include flexible connectors when indicated.
- C. Sediment Traps: Install tee fitting with capped nipple in bottom forming drip, as close as practical to inlet for appliance using gas.
- D. Electrical Connections: Wiring is specified in Division 16 Sections.

### 3.10 ELECTRICAL BONDING AND GROUNDING

- A. Install aboveground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.
- B. Do not use gas piping as grounding electrode.

### 3.11 FIELD QUALITY CONTROL

- A. Inspect, test, and purge piping according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and requirements of authorities having jurisdiction.
- B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- C. Report test results promptly and in writing to Commissioner and authorities having jurisdiction.
- D. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.
- E. Verify correct pressure settings for pressure regulators.

- F. Verify that specified piping tests are complete.

### 3.12 PAINTING

- A. All exposed gas pipe in the unfinished area shall receive one(1) coat of Tnemec 10-99 or Benjamin Moore Iron Clad Retardo or approved equal rust inhibitive primer paint and one(1) finished coat of safety yellow.
- B. All exposed gas pipe in finished spaces or run exposed outside of the building shall receive one (1) coat of Tnemec 10-99 or Benjamin Moore Iron Clad Retardo or approved equal rust inhibitive primer paint and one (1) finished coat of flat or enamel to match adjoining surfaces.
- C. Mill-wrapped piping shall not be painted.
- D. Piping at different pressure levels in the same space shall be color coded and labeled.
- E. For additional materials and method of painting, refer to Section 09900 – Painting.

### 3.13 ADJUSTING

- A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

-END OF SECTION

**Section 15191**  
**DIESEL FUEL PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish all labor, materials, equipment and incidentals as shown, specified and required to furnish, install and test diesel fuel containment piping. Diesel fuel containment piping shall include the entire system consisting of carrier pipe, secondary containment pipe, special fittings, and all appurtenances required for a complete system as shown on contract drawings and specified herein.
- B. Limitations: Secondary containment piping shall be provided for all diesel fuel piping outside of containment structures. Secondary containment piping shall be provided for buried, encased and exposed piping located outside of containment structures.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01330 - Shop Drawings
- B. Section 01431 - Quality Assurance Inspection
- C. Section 01831 - Operation and Maintenance Manuals
- D. Section 01651 - Transportation and Handling of Materials and Equipment
- E. Section 01661 - Protecting of Materials and Equipment
- F. Section 15060 - Hangers and Supports
- G. Section 15076 - Piping and Equipment Identification
- H. Section 15120 - Interior and Exposed Piping Schedule
- I. Section 16230 - Packaged Engine Generator System

**1.03 REFERENCES**

- A. ANSI – American Standards Institute
- B. ASME B31.1 – Power Piping
- C. ASME B31.3 – Process Piping
- D. ASME - Boiler and Pressure Vessel Code
- E. ASTM D-2996 – Standard Specification to Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
- F. ASTM D-2992 – Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings



- G. ASTM D-2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

#### 1.04 SUBMITTALS

- A. Provide all shop drawings as specified in the General Conditions and Section 01330, Shop Drawings. Drawings shall include details of pipe fabrications, including supporting devices, method of attachment, spacing, pre-fabricated double containment fitting dimensions, starting and termination connections, high point vent and low point drain details for the secondary containment, valves, and accessories.
- B. Joint details, methods, and locations of supports, and all other pertinent technical data for all piping to be furnished shall be submitted.
- C. Provide Field Assembly Instructions

#### 1.05 QUALITY ASSURANCE AND QUALIFICATIONS

- A. Quality Assurance shall be in accordance with Section 01431, Quality Assurance Inspection and as stated below.
- B. Manufacturer shall have a minimum of three (3) years experience in production of similar piping system.
- C. Contractor must have taken, if applicable, manufacture's training courses on the installation of piping and meet the licensing requirements in the State of New York.
- D. The double containment piping system shall be a pre-fabricated system as manufactured by IPEX or approved equal.
- E. The system shall be fabricated, installed and tested in accordance with the manufacturer's recommendations and as specified herein and shall be suitable for use with Diesel, Bio Diesel and 100% Ethanol.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01651 - Transportation and Handling of Materials and Equipment and Section 01661 - Protection of Materials and Equipment.
- B. Care: Use every precaution to prevent damage to the double containment piping during transportation and delivery to the site. Take extreme care in loading and unloading equipment and accessories.
  - 1. Do not allow the piping to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.

2. If, in the process of transportation or handling, any piping is damaged, replace such piping or accessories.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. The containment piping system shall consist of Schedule 40 T304L Stainless Steel carrier piping system supported within a UL FRP secondary containment housing. The system shall be provided with suitable drains and vents and be designed to provide complete drainage of the secondary containment piping. Interstitial supporting devices shall be made from Polypropylene or UL FRP clips and shall be provided within the secondary containment pipe, and shall be designed to allow continuous drainage in the annular space to the containment sumps. Drain fittings shall be designed to allow a valve attachment to be made so that the secondary containment compartment may be readily drained and manually checked for leaks.
- B. Piping shall be installed in accordance with the manufacturer's instructions especially regarding linear expansion due to temperature differentials. Contractor shall consider the linear expansion of the pipelines when installing them and provisions shall be made to compensate for such changes in length. Lowest expected temperatures that the piping will be subjected to shall be assumed to be - 5°F; highest expected temperatures shall be either 105°F or the actual air temperature when the piping is installed, whichever is greater.

### 2.02 MATERIALS

- A. Primary carrier pipe and fittings shall be manufactured from Schedule 40 T304L Stainless Steel materials as listed by ASTM and ANSI.
- B. Secondary containment pipe and fittings shall be UNSPLIT, UL FRP or approved equal.
- C. All listed primary pipe and containments shall be schedule 40 materials. Pipe shall have Schedule 40 steel pipe thickness according to ANSI. All listed pressure fittings shall be Schedule 40 T304L stainless steel according to ANSI. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness and reinforcement so as to be able to maintain the same pressure ratings as the equivalent Schedule 40 steel pipe.
- D. All Secondary containment pipe and fittings shall meet ASTM specifications D-2310, D-2992, and D-2996. Containment fittings shall have carrier components pre-assembled, supported and tested. Mitered pipe shall not be permitted. Carrier fittings shall be pre-beveled ready for welding. Containment fittings shall have spigot ends to allow for an unsplit closure coupling or approved equal to be installed after primary system pressure tested. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness

and reinforcement so as to be able to maintain the same pressure rating as the equivalent unsplit UL FRP pipe and fittings or their approved equal vent.

- E. All fittings will be pre-assembled and pre-tested by the manufacturer.
- F. Both the pipe and fittings shall be from the same manufacturer, to ensure both material and dimension compatibility.
- G. Containment pipe manufacturer shall provide, where necessary, all special fittings to contain where applicable line shutoff valves, checks, and flanges.

## 2.03 SYSTEM JOINTING AND ASSEMBLY

- A. Primary carrier pipe shall be fully welded.
  - 1. All welds shall be made using gas arc welding techniques according to ASME B31.1
    - a. GAW
    - b. TIG
    - c. MIG
- B. Secondary containment joints shall use multiple piece split closure couplings.
  - 1. Only manufacturer's recommended and approved adhesives shall be used in the assembly of the containment pipe.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All installation procedures shall be according to the manufacturer's specific recommendations.
- B. Manufacturer shall furnish the services of a qualified representative to supervise the contractor's personnel during the start of installation.
- C. All contractor personnel that will perform gas welded stainless steel field welds shall be qualified to do so according to the requirements of ASME Boiler and Pressure Vessel Code.
- D. All contractor personnel that will perform epoxy cemented joints shall be qualified for such bonding practices according to the bonding qualification procedures described in ASME B31.3, Chapter VII for bonding of plastic piping.

- E. Secondary containment piping shall be supported from hangers and supports and shall be installed per pipe manufacturer's instructions. Pipe hangers and supports shall be provided per the requirements of Section 15060, Hangers and Supports.
- F. Piping shall be installed in accordance with manufacturer's instructions regarding linear expansion due to temperature differentials.

### 3.02 FIELD TESTS

- A. The manufacturer shall submit test procedures for approval prior to installation.
- B. After installation, and prior to concrete encasement (where indicated) test both primary carrier piping and secondary containment piping for leaks.
  - 1. Primary carrier piping system shall be pressure tested at 150% of the system design pressure for a period of one hour.
  - 2. Testing of primary carrier pipe shall be conducted during the installation at intervals to be determined by the manufacturer.
  - 3. Secondary containment piping system shall be pneumatically tested at a minimum duration of two and a half (2.5) hours. The external joints shall be soaped and visually inspected for leaks. A working pressure regulator shall be used during the pneumatic test to insure that over-pressurization of the UL FRP, beyond 5psi, cannot occur. All precautions should be taken to protect against the hazard of a possible brittle fracture of UL FRP under compressed gas.
  - 4. All tests shall be done in accordance with manufacturer's recommendations, and witnessed by a representative of the pipe manufacturer.
- C. After installation, primary carrier piping system shall be flushed clean per manufacturer's recommendations. The contractor shall check the operation of all valves and appurtenances.
- D. The annular space shall be purged of moisture contained air by replacing the volume of air with clean, dry nitrogen.

### 3.03 MANUFACTURER'S FIELD SERVICES

- A. The services of a qualified manufacturer's service representative shall be provided for the following:
  - 1. Supervise the initial installation of the double containment pipe system.

2. Train the contractor's personnel in the proper methods of field testing the integrity of the double containment pipe system and assist in the performance of field tests.
- B. Services of the representative shall be provided for the following minimum durations:
1. Installation Supervision: one (1) visit of one (1) day
  2. Field Tests: One (1) visit of one (1) day, or as recommended by the manufacturer
- C. Reports from the manufacturer shall be submitted for each visit to the site. Provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.

-END OF SECTION-

**Section 15271**  
**STORMWATER TREATMENT SYSTEM**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The Contractor, and/or a manufacturer selected by the Contractor and approved by the Commissioner, shall furnish all labor, materials, equipment and incidentals required and install all precast concrete stormwater treatment systems and appurtenances in accordance with the Drawings and these specifications.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02504 - Sanitary and Storm Sewer Structures
- B. Section 02316 - Excavation
- C. Section 02317 - Backfilling
- D. Section 05561 - Miscellaneous Metal Castings

**1.03 REFERENCES**

- A. ASTM B209: Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
- B. ASTM C32: Standard Specification for Manhole Brick
- C. ASTM C139: Standard Specification for Concrete Masonry Units for Construction of Catch Basin and Manholes
- D. ASTM C150: Standard Specification for Portland Cement
- E. ASTM C595M: Standard Specification for Blended Hydraulic Cements
- F. ASTM C857: Standard Practice for Minimum Structural Loading for Underground Precast Concrete Utility Structures
- G. ASTM C858: Standard Specification for Underground Precast Concrete Utility Structures
- H. ASTM C891: Standard Practice for Installation of Underground Precast Utility Structures
- I. ASTM C990: Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

#### 1.04 SUBMITTALS

- A. Submit the following in accordance with the General Conditions and Section 01330 "Shop Drawings."
  - 1. Dimensional drawings showing details for construction, reinforcing, joints and any cast in place appurtenances. Indicate all material to be used and all applicable standards for materials, required test of materials and design assumptions for structural analysis. Scale of the shop drawing shall be not less than 1/4 in per foot.
  - 2. Design calculations and shop drawings shall be certified by a Professional Engineer retained by the system manufacturer or contractor and licensed in the State of New York

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Stormwater treatment system shall be a Vortechs System as manufactured by CONTECH Stormwater Solution, Inc. or approved equal.
- B. Stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 3 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff during the aforementioned period.

#### 2.02 MATERIALS

- A. Concrete for precast stormwater treatment systems shall conform to ASTM C857 and C 858 and meet the following additional requirements:
  - 1. The wall thickness shall not be less than 6 inches or as shown on the dimensional drawings. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 (MS18) loading requirements as determined by a Licensed Professional Engineer.
  - 2. Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C 990.
  - 3. Cement shall be Type II Portland cement conforming to ASTM C 150.
  - 4. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi (28 MPa) or until 5 days after fabrication and/or repair, whichever is the longer.
  - 5. Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C 595M

- B. Internal aluminum plate components shall be aluminum alloy 5052-H32 in accordance with ASTM B 209.
- C. Sealant to be utilized at the base of the swirl chamber shall be 60 durometer extruded nitrile butadiene rubber (Buna N) and shall be provided to the concrete precaster for installation.
- D. Brick or masonry used to build the manhole frame to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.
- E. Casting for manhole frames and covers shall be in accordance with Section 05561-Miscellaneous Metal Castings.

## 2.03 PERFORMANCE

- A. Stormwater treatment system shall adhere to the following performance specifications at the design treatment capacities, as listed below:

Design Treatment Capacity (cfs)/(l/s)	Sediment Storage (yd <sup>3</sup> )/(m <sup>3</sup> )
6.0 - 8.5 (175-240)	3.2 (2.45)
14 - 17.5 (400-500)	5.6 (4.28)

- B. A verified proprietary stormwater management practice shall be used and sized per Chapter 9 (Application, sizing and performance criteria, as well as alternative practices for redevelopment projects) of the New York State Stormwater Management Design Manual (New York State Department of Environmental Conservation, January 2, 2007).
- C. Stormwater treatment system shall include a circular aluminum "swirl chamber" (or "grit chamber") with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates.
- D. Stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re-entrainment of trapped floating contaminants.
- E. Individual stormwater treatment systems shall have the Design Treatment Capacity listed in a table in Part 2.03, Section A., and shall not re-suspend trapped sediments or re-entrain floating contaminants at flow rates up to and including the specified Design Treatment Capacity.
- F. Individual stormwater treatment systems shall have usable sediment storage capacity of not less than the corresponding volume listed in the table in Part 2.03, Section A. The systems shall be designed such that the pump-out volume is less



than ½ of the total system volume. The systems shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

- G. A water-lock feature shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance. There shall be no appurtenances or restrictions within these chambers.
- H. Stormwater treatment systems shall be completely housed within one rectangular structure.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Stormwater Treatment System shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Commissioner.
- B. Place the precast base unit on a granular subbase of minimum thickness of six inches after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-leveled.
- C. Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C 990 along the construction joint in the section that is already in place.
- D. After setting the base and wall or riser sections, prepare to install the swirl chamber. Place the 3/4-inch thick by 3/4-inch wide butyl mastic seal vertically on the outside of the swirl chamber starting one inch above the bottom of the swirl chamber and continuing to a height equal to the elevation of the bottom of the upper aperture of the swirl chamber. The butyl mastic seal should abut the downstream side of the pre-drilled mounting holes that attach the swirl chamber to the long walls of the concrete vault. Next, install the extruded Buna N seal on the bottom edge of the 180 degree downstream section of the swirl chamber by first applying a bead of Sikaflex-1a polyurethane elastomeric sealant into the extruded slot then slide the seal onto the swirl chamber. The extruded seal should extend 3-inches upstream of the mounting holes, toward the inlet end of the vault. Set the swirl chamber into position and keep the seal approximately ½-inch above the floor of the concrete vault. Apply a continuous bead of Sikaflex-1a sealant under the cupped bottom of the seal. Set the circular swirl chamber on the floor of the vault and anchor it by bolting the swirl chamber to the side walls of the concrete vault at the three (3) tangent points and at the inlet tab using HILTI brand stainless steel drop-in wedge

anchors or equivalent 3/8-inch (10 mm) diameter by 2-3/4 inch minimum length at heights of approximately three inches (3") off the floor and at fifteen inch (15") intervals to approximately the same height of the butyl mastic sealant (at locations of pre-drilled holes in aluminum components). Apply a continuous bead of Sikaflex-1a sealant to the intersection of the inside bottom edge of the extruded seal and the vault floor.

- E. If the oil baffle wall (Baffle A) and flow control wall (Baffle B) are not integrally cast-in to riser/wall sections then the Baffle wall panels shall be placed in the formed keyways or between bolted-in-place angle flanges as provided by the manufacturer. Apply non-shrink grout or Sikaflex-1a sealant to each end of Baffle A and Baffle B at the upstream intersection with the side walls of the concrete vault.
- F. Prior to setting the precast roof section, bitumen sealant equal to ASTM C 990 shall be placed along the top of the oil baffle wall (Baffle A), using more than one layer of mastic if necessary, to a thickness at least 1-inch (25 mm) greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. Do not seal the top of Baffle B unless specified on the shop drawings to do so. After placement of the roof section has compressed the butyl mastic sealant in the gap over Baffle A, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. If roof section is "clamshell" or "bathtub" halves, then finish sealing the ends of the Baffle walls by applying non-shrink grout or Sikaflex-1a sealant to each end of Baffle A at the upstream intersection with the side walls of the concrete vault and to each end of Baffle B at the downstream intersection with the side walls of the concrete vault.
- G. After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a 1/4-inch (6 mm) maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch (152 mm) lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Commissioner. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C 891 "Standard Practice for Installation of Underground Precast Utility Structures".
- H. Holes made in the concrete sections for handling or other purposes shall be plugged with a nonshrink grout or by using grout in combination with concrete plugs.
- I. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections

3.02 FIELD QUALITY CONTROL

A. Removal of Rejected Work

1. Mark sections rejected after delivery to the site for identification and remove from the site at once
2. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, repaired to the Commissioner's acceptance level or removed and replaced, entirely at Contractor's expense.

B. Cleaning

1. Clean the system in accordance with manufacturer's specification.

-END OF SECTION-

**Section 15410**  
**PLUMBING FIXTURES AND TRIM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section includes plumbing fixtures and related components.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15412 - Emergency Plumbing Fixtures.
- B. Section 15415 - Water Coolers.
- C. Section 15430 - Plumbing Specialties, for backflow preventers and specialty fixtures not in this Section.

**1.03 SUBMITTALS**

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

**1.04 QUALITY ASSURANCE**

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
  - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M
  - 2. Hand Sinks: NSF 2 construction
  - 3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M
  - 4. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M
  - 5. Vitreous-China Fixtures: ASME A112.19.2M
  - 6. Water-Closet, Flushometer Tank Trim: ASSE 1037
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
  - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M
  - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M
  - 3. Faucet Hose: ASTM D 3901
  - 4. Faucets: ASME A112.18.1M
  - 5. Hose-Connection Vacuum Breakers: ASSE 1011
  - 6. Hose-Coupling Threads: ASME B1.20.7
  - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001
  - 8. NSF Materials: NSF 61
  - 9. Pipe Threads: ASME B1.20.1
  - 10. Supply and Drain Fittings: ASME A112.18.1M
- H. Comply with the following applicable standards and other requirements specified for shower faucets:
  - 1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M
  - 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016
  - 3. Faucets: ASME A112.18.1M

4. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445
  5. Manual-Control Antiscald Faucets: ASTM F 444
  6. Pipe Threads: ASME B1.20.1
  7. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016
  8. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001
  2. Brass and Copper Supplies: ASME A112.18.1M
  3. Manual-Operation Flushometers: ASSE 1037
  4. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Floor Drains: ASME A112.21.1M
  2. Hose-Coupling Threads: ASME B1.20.7
  3. Off-Floor Fixture Supports: ASME A112.6.1M
  4. Pipe Threads: ASME B1.20.1
- 1.05 COORDINATION
- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.
- 1.06 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
  3. Faucet, Laminar-Flow Fittings: Equal to 10 percent of amount of each type and size installed, but not less than 2 of each type and size.

4. Faucet, Flow-Control Fittings: Equal to 10 percent of amount of each type and size installed.
5. Supply, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
6. Shower, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
7. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but not less than 12 of each type.
8. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
9. Flushometer Tank, Repair Kits: Equal to 5 percent of amount of each type installed, but not less than 2 of each type.
10. Toilet Seats: Equal to 5 percent of amount of each type installed.

## PART 2 PRODUCTS

### 2.01 LAVATORY FAUCETS

- A. Lavatory Faucet, P-4: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
  1. Product: Chicago Faucets, Model No. 802-VCP or approved equal
  2. Body Material: Cast brass, quarter-turn washerless ceramic disc valve
  3. Finish: Polished chrome plate
  4. Type: Two-handle mixing
  5. Centers: 4 inches
  6. Mounting: Deck, exposed
  7. Handles: Curved level handles
  8. Inlets: NPS 3/8 tubing, with NPS 1/2 male adaptor
  9. Spout: Rigid
  10. Spout Outlet: Standard Aerator, vandal-resistant

11. Drain: Grid
12. Maximum flow rate: 2.2 GPM

## 2.02 SHOWER FAUCETS

- A. Shower Faucet, P-6: Provide and install Acorn Apex flush-mounted showers 411-W-P-BS-G housing shall be 16 gage, type 304 stainless steel with satin finish. All internal piping shall be copper tubing and bronze or wrought copper fittings. Shower head shall be Acorn Logan with adjustable spray from coarse stream to fine mist. Shower shall be pre-piped and hydrostatically factory test at 150 PSI. Shower shall be provided with the following optional equipment.
1. Model: Acorn, Model 4-APEX or approved equal
  2. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated
  3. Valve: Safti-Therm, hot & cold temperature balancing
  4. Supply: Wall
  5. Shower Head:, Extended head – 17½"
  6. Hand volume control
  7. Soap Dish
  8. Privacy Compartment: Stainless Steel

## 2.03 SINK FAUCETS

- A. Sink Faucet, P-5: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturer: Elkay, LK4103F
  2. Maximum Flow Rate: 2.2 gpm, unless otherwise indicated
  3. Body Material: Cast brass
  4. Finish: Polished chrome plate
  5. Type: Kitchen faucet with spray, three-hole fixture
  6. Mixing Valve: Single control
  7. Backflow Protection Device for Side Spray: Required
  8. Centers: 4 inches
  9. Mounting: Deck, exposed
  10. Handle: Lever
  11. Inlets: NPS 3/8 plain-end tubing
  12. Spout: Swing, round tubular
  13. Spout Outlet: Aerator, Spray
  14. Drain: Grid
  15. Tempering Device: High-temperature limit stop



## 2.04 TOILET SEATS

## A. Toilet Seat: Solid plastic

1. Manufacturer: Olsonite: Model WC-1/WC-1A
2. Configuration: Open front
3. Size: Elongated
4. Class: Standard commercial
5. Hinge Type: check
6. Color: White

## 2.05 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Guard: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.

## 2.06 FIXTURE SUPPORTS

- A. Water-Closet Support, P-1: Water-closet combination carrier designed for standard mounting height, adjustable closet carrier. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; epoxy coated cast iron, couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

1. Manufacturer: Watts Drainage, Model No. ISCA-101-L/R or approved equal

- B. Urinal Support, P-2: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.

1. Accessible Fixture Support: Include rectangular steel uprights

- C. Lavatory Support, P-4: Lavatory carrier with concealed arms and tie rod Include steel uprights with feet, adjustable epoxy coated iron arms with leveling screws and basin locking device.

1. Manufacturer: Watts Drainage: Model No. CA-411/CA-411-WC, or approved equal

## 2.07 SHOWER RECEPTORS

- A. Shower Receptor: Base for built-up shower.

1. Manufacturer: Stern Williams, Model 14 or approved equal
2. Type: Standard

3. Material: Precast terrazzo with slip-resistant bathing surface complying with ASTM F 462
4. Size: 36 by 36 inches
5. Color: White
6. Outlet: Cast-in-floor drain with NPS 2 outlet

## 2.08 WATER CLOSETS

### A. Water Closets, P-1: Wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation

1. Product: American Standard, AFWall 2257.103 or approved equal
2. Style: One piece
  - a. Bowl Type: Elongated with siphon-jet design
  - b. Design Consumption: 1.6 gal./flush
  - c. 1-1/2" Top Spud
3. Style: Flushometer valve
  - a. Bowl Type: Elongated siphon-jet design
    - (1) Design Consumption: 1.6 gal./flush
4. Flushometer: Sloan, Royal 111 or approved equal

## 2.09 URINALS

### A. Urinals, P-2: Wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.

1. Product: American Standard, Model Trimbrook 6561.017 or approved equal
2. Type: Washout with extended shields
3. Strainer: Separate removable strainer with integral trap
4. Design Consumption: 1.0 gal./flush
5. Color: White
6. Supply Spud Size: NPS 3/4

7. Outlet Size: NPS 2
8. Flushometer: Sloan, 186-1.0 or approved equal

## 2.10 LAVATORIES

### A. Lavatories, P-4: Wall-hanging, vitreous-china fixture.

1. Product: American Standard, Model Lucerne Wall-Mount Sink, Model No. 0356.421 or approved equal
2. Type: With back
3. Size: 20 by 18 inches, rectangular
4. Faucet Hole Punching: Two, 4-inch centers, holes
5. Faucet Hole Location: Top
6. Color: White
7. Faucet: Lavatory
8. Supplies: NPS 3/8 chrome-plated copper with stops
9. Drain: Grid
10. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated cast-brass trap; thick tubular brass waste to wall; and wall escutcheon
11. Protective Shielding Guards

## 2.11 COUNTER TOP SINK

### A. Counter top sinks, P-3

1. Product: Crane Plumbing, Model No. Stevens 1299V or approved equal
2. Size: 18" Round, acid resisting, porcelain enameled steel, self-rimming
3. Faucet Hole Punching: Three, 4-inch centers, holes
4. Faucet Hole Location: Top
5. Color: White Porcelain Enameled Steel
6. Supplies: NPS 3/8 chrome-plated copper with stops

7. Drain: Grid
8. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated cast-brass trap; thick tubular brass waste to wall; and wall escutcheon

## 2.12 KITCHEN SINKS

- A. Kitchen Sinks, P-5: Seamlessly drawn of 18 gauge, type 304, nickel bearing stainless steel, self-rimming fixture
  1. Product: Elkay Model LRQ2522 or approved equal
  2. Overall Size: 25 by 22 inches
  3. Number of Compartments: One
  4. Supplies: NPS 1/2 chrome-plated copper with stops
  5. Strainer: NPS 1-1/2"
  6. Drain Piping: NPS 1-1/2 chrome-plated cast-brass trap, 0.045-inch- thick tubular brass waste to wall and wall escutcheon

## 2.13 SERVICE BASINS

- A. Service Basins, P-7: Flush-to-wall, floor-mounting receptor composed of pearl gray marble ships and white Portland cement ground smooth, grouted and sealed to resist stains terrazzo basin with rim guard.
  1. Product: Stern-Williams Co., Inc.; Model SB-702 approved equal
  2. Shape: Square
  3. Size: 24 by 24 inches
  4. Height: 12 inches
  5. Tiling Flange: On two sides
  6. Rim Guard: Stainless steel, on all top surfaces
  7. Color: White
  8. Faucet: Sink Model T-10-VB, Mop sink service sink fitting with vacuum breaker, adjustable top brace, 3/4" hose thread on spout with bucket hook inlets 8" on center, chrome finish
  9. Splash catcher panels of 20 gauge, type 304 stainless steel

10. Drain: Cast brass with stainless steel strainer, with NPS 3 outlet

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
  1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. Install wall-hanging fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Section 15112 - Valves Smaller than 4 Inches of the Structures and Equipment Contract for general-duty valves.

- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
  - I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
  - J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
  - K. Install toilet seats on water closets.
  - L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
  - M. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
  - N. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
  - O. Install traps on fixture outlets.
    - 1. Exception: Omit trap on fixtures with integral traps.
    - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
  - P. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
  - Q. Set shower receptors, and service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.
  - R. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Section 07921 - Interior Sealants of the Structures and Equipment Contract for sealant and installation requirements.
- 3.03 CONNECTIONS
- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
  - B. Connect water supplies from water distribution piping to fixtures.
  - C. Connect drain piping from fixtures to drainage piping.

- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

### 3.04 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

### 3.05 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

### 3.06 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.

3.07 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by the City.

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 15412**  
**EMERGENCY PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following emergency plumbing fixtures:

1. Combination units
2. Water-tempering equipment

**1.02 DEFINITIONS**

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Tempered: Approximately 85 deg F temperature
1. Allowable Variation: Plus or minus 5 deg F

**1.03 SUBMITTALS**

- A. Product Data: Include flow rates and capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals specified in Division 1.

**1.04 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

## 1.05 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

## PART 2 PRODUCTS

### 2.01 COMBINATION UNITS

- A. Combination Units: Plumbed, freestanding type with emergency shower and eye/face wash equipment. A-SEW-01, A-SEW-02, A-SEW-03, A-SEW-04.

#### 1. Products

- a. Bradley Corporation
- b. Chicago Faucet Co.
- c. Encon Safety Products
- d. Haws Corporation
- e. Murdock, Inc.
- f. Speakman Co.
- g. Guardian Equipment Co.
- h. Or approved equal

#### 2. Piping: Galvanized steel

- a. Unit Supply: NPS 1-1/2 from top
- b. Unit Drain: Outlet at side near bottom
- c. Shower Supply: with flow regulator and stay-open control valve
- d. Eye/Face Wash Supply: NPS 1/2 with flow regulator and stay-open control valve

#### 3. Shower Capacity: Deliver potable water at rate not less than 20 gpm for at least 15 minutes.

- a. Control-Valve Actuator: Pull chain
- b. Shower Head: 10-inch minimum diameter, stainless steel

#### 4. Eye/Face Wash Equipment: With capacity to deliver potable water at rate not less than 3.0 gpm for at least 15 minutes.

- a. Control-Valve Actuator: Push bar and foot treadle
- b. Receptor: stainless-steel bowl
- c. Dust cover: Stainless-steel

#### 5. Alarm: Emergency alarm and light complete with an amber flashing light and 90 db at 10 feet, buzzer that is operated by flow switch. Unit is activated when

the emergency shower or eye shower or eye is in operation. 120 volts, 60 cycles, provide a relay contact DPDT for SCADA system, Haws Model No. 9001 with 9001 DPDT.

6. Combination unit shall be Model No. 8347 as Manufactures by Haws or approved equal.
- B. Combination Units: freeze-protected, freestanding type with emergency shower and eye/face wash equipment. A-SEW-01, A-SEW-02. A-SEW-04
1. Products
    - a. Encon Safety Products
    - b. Guardian Equipment Co.
    - c. Haws Corporation
    - d. Speakman Co.
    - e. Or approved equal
  2. Piping: Stainless steel
    - a. Unit Supply: NPS 1-1/4 minimum, side
    - b. Shower Supply: NPS 1 with flow regulator and stay-open control valve
    - c. Eye/Face Wash Supply: NPS 1/2 with flow regulator and stay-open control valve
  3. Heating System: Electric, 120V ac; and insulation with protective jacket
  4. Shower Capacity: Deliver potable water at rate not less than 20 gpm for at least 15 minutes
    - a. Control-Valve Actuator: Pull rod
    - b. Shower Head: 10-inch minimum diameter, plastic
  5. Eye/Face Wash Equipment: With capacity to deliver potable water at rate not less than 3.0 gpm for at least 15 minutes
    - a. Control-Valve Actuator: Push bar
  6. Freeze protection bleed valve, automatically opens to flush water during freezing conditions and power failures.
  7. Alarm: Emergency alarm and light complete with an amber flashing light and 90 db at 10 feet, buzzer that is operated by flow switches Unit is activated when the emergency shower or eye shower or eye is in operation. 120 volts, 60 cycles, provide a relay contact for SCADA system, Haws Model No. 9001 with 9001 DPDT or approved equal.

8. Freeze resistant combination unit shall be Model No. 8317CTFP, 120V or approved equal.
- C. Wall Mounted Emergency Eye Wash: A-SEW-03
1. Products
    - a. Encon Safety Products
    - b. Guardian Equipment Co.
    - c. Haws Corporation
    - d. Speakman Co.
    - e. Or approved equal
  2. Piping: Stainless steel
    - a. Unit Supply: NPS 1/2" minimum, side
    - b. 11" Round stainless steel receptor, aluminum wall bracket, and twin soft-flo ABS plastic anti-surge eyewash heads
    - c. With waste tailpiece and trap
    - d. Stainless steel dust cover.
    - e. Manufactured by Haws Model No. 7460BT or approved equal
  3. Alarm: Emergency alarm and light complete with an amber flashing light and 90 db at 10 feet, buzzer that is operated by flow switches. Unit is activated when the emergency shower or eye shower or eye is in operation. 120 volts, 60 cycles, provide a relay contact for SCADA system, Haws Model No. 9001 with 9001 DPDT or approved equal.
- D. Tempered Water Blending System for emergency/ shower/eye wash: Guardian Equipment Co. or approved equal. System consists of mixing hot and cold water to provide tempered water up to 44 gpm for emergency shower and eyewashes. Consists of a thermostatic mixing valve, a high temperature limit valve, a bypass valve and outlet temperature gauge. Unit is constructed of bronze, brass copper and stainless steel. Complete with tempered water blending system cabinet.
- E. Tempered Water Blending System for emergency eye wash: Guardian Equipment Co. or approved equal. System consists of mixing hot and cold water to provide tempered water up to 5 gpm for emergency eyewash. Consists of a thermostatic mixing valve, a high temperature limit valve, a bypass valve and outlet temperature gauge. Unit is constructed of bronze, brass copper and stainless steel. Complete with tempered water blending system cabinet.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components according to manufacturer's written instructions.
  - B. Install fixtures level and plumb.
  - C. Fasten fixtures to substrate.
  - D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position. Install valves in locations where they can easily be reached for operation. Refer to Section 15110 - Plumbing Valves for general-duty shutoff valves.
    - 1. Exception: Omit shutoff valves on valved supplies to group of plumbing fixtures that includes emergency plumbing fixture.
    - 2. Exception: Omit shutoff valves on supplies to emergency equipment if prohibited by authorities having jurisdiction.
  - E. Install shutoff valve and strainer in steam piping and shutoff valve in condensate return piping.
  - F. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Refer to Section 15050 - Basic Mechanical Materials and Methods for dielectric fittings.
  - G. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Refer to Section 15050 - Basic Mechanical Materials and Methods for escutcheons.
- 3.03 CONNECTIONS
- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
  - B. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment.

- C. Connect hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.
- D. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary or storm drainage piping.
- E. Ground Equipment
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

#### 3.04 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.
- B. Electrical-Component Testing: After electrical circuitry has been energized, test for compliance with requirements.
  - 1. Test and adjust controls and safeties.
- C. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
- D. Report test results in writing.

#### 3.05 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

-END OF SECTION-

**Section 15415**  
**WATER COOLERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water-station water coolers
- B. Fixture supports

**1.02 GENERAL REQUIREMENTS**

- A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of fixture.
- C. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

**1.03 SUBMITTALS**

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Maintenance Data: For fixtures to include in maintenance manuals specified in Division 1.

**1.04 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about fixtures for people with disabilities.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.



- D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

#### 1.05 COORDINATION

- A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

#### 1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Filter Cartridges: Equal to 10 percent of amount installed for each type and size indicated, but not less than 10 of each.

### PART 2 PRODUCTS

#### 2.01 WATER COOLERS

- A. Water Coolers, P-8

- 1. Available Products: Haws electric water cooler, Model H1119.8 or approved equal
  - 2. Products: Haws or approved equal
    - a. Model: Barrier Fee, dual height, Electric Drinking Fountain
  - 3. Cabinet: All 304 stainless steel, satin finish with refrigerated compartment in front panel
  - 4. Bubbler: One, with automatic stream regulator, located on deck
  - 5. Control: Push button
  - 6. Supply: NPS 3/8 with ball, gate, or globe valve
  - 7. Drain: Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.1 for each fountain

8. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat
  - a. Capacity: 8 gph of 50 deg F cooled water from 80 deg F inlet water and 90 deg F ambient air temperature
  - b. Electrical Characteristics: 1/8 hp; 110V ac; single phase; 60 Hz

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.
- B. Examine walls and floors for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 APPLICATIONS

- A. Use mounting frames for recessed water coolers, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

#### 3.03 INSTALLATION

- A. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.
- B. Install fixtures level and plumb.
- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Section 07921 - Interior Sealants for sealant and installation requirements.

## 3.04 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Ground Equipment
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

## 3.05 FIELD QUALITY CONTROL

- A. Water-Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.
- B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
- C. Report test results in writing.

## 3.06 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust water-cooler temperature settings.

## 3.07 CLEANING

- A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

-END OF SECTION-

**Section 15430**  
**PLUMBING SPECIALTIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES****A. This Section includes the following plumbing specialties:**

1. Backflow preventers
2. Strainers
3. Key-operation hydrants
4. Drain valves
5. Miscellaneous piping specialties
6. Sleeve penetration systems
7. Flashing materials
8. Cleanouts
9. Floor drains
10. Trench drains
11. Roof drains

**1.02 RELATED SPECIFICATIONS**

- A. Section 09967 - Coating for Steel Waterfront Structures
- B. Section 15122 - Meters and Gages, for water meters, thermometers, and pressure gages.

**1.03 SUBMITTALS****A. Product Data:** Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Backflow preventers and water regulators
2. Strainers
3. Thermostatic water mixing valves and water tempering valves
4. Water hammer arresters and air vents
5. Drain valves, hose bibs and hydrants
6. Cleanouts, floor drains, open receptors, trench drains, and roof drains.
7. Vent caps, vent terminals, and roof flashing assemblies
8. Sleeve penetration systems

**B. Field test reports****C. Maintenance Data:** For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators

2. Water filters
3. Thermostatic water mixing valves and water tempering valves

#### 1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated.
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- D. City of New York Department of Environmental Protection
  1. Typical Water Meter Setting Details and Regulations
  2. Chapter 20 Rules Governing and Restricting the Use and Water
- E. NSF Compliance
  1. Comply with NSF 61, "Drinking Water System Components--Health Effects", Sections 1 through 9, for potable domestic water plumbing specialties.

#### 1.05 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Water Filter Cartridges: Equal to 200 percent of amount installed for each type and size indicated.
  2. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

### PART 2 PRODUCTS

#### 2.01 BACKFLOW PREVENTERS

- A. Manufacturers
  1. Ames Co., Inc.
  2. Cla-Val Co.
  3. CMB Industries, Inc.; Febco Backflow Preventers
  4. Conbraco Industries, Inc.
  5. Mueller Co.; Hersey Meters Div.
  6. Watts Industries, Inc.; Water Products Div.

7. Zurn Industries, Inc.; Wilkins Div.
  8. Or approved equal
- B. General: ASSE standard, backflow preventers
1. NPS 2 and Smaller: Bronze body with threaded ends
  2. NPS 2-1/2 and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends
    - a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body
  3. Interior Components: Corrosion-resistant materials
  4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system
  5. Strainer: On inlet, if indicated
- C. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent
- D. Hose-Connection Vacuum Breakers: ASSE 1011, nickel-plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze
- E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.
- F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves. Reduced-Pressure Backflow Preventers shall be the type approved by NYC Department of Environment Protection.
1. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range
- G. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.
1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range
  2. Units in paragraph below are for low hazard and are available in NPS 1/2 to NPS 1-1/4 (DN 15 to DN 32).

3. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range

- H. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer. Double-Check Detector Assembly Backflow Preventers shall be the type approved by NYC Department of Environment Protection.

1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range

- I. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head of water back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.
- J. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

## 2.02 STRAINERS

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated. Strainers shall be the type approved by NYC Department of Environment Protection.

1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated
2. NPS 2 and Smaller: Bronze body, with female threaded ends
3. NPS 2-1/2 and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown
  - a. Drain: Factory- or field-installed, hose-end drain valve
5. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket

- B. Drainage Basket Strainers: Non-pressure-rated, cast-iron or coated-steel body; with bolted flange or clamp cover and drain with plug

1. Basket: Bronze or stainless steel with 1/8- or 3/16-inch- diameter holes and lift-out handle

2. Female threaded ends for NPS 2 and smaller, and flanged ends for NPS 2-1/2 and larger

## 2.03 KEY-OPERATION HYDRANTS

### A. Manufacturers

1. Josam Co.
2. Murdock, Inc.
3. Smith, Jay R. Mfg. Co.
4. Watts Industries, Inc.; Drainage Products Div.
5. Woodford Manufacturing Co.
6. Zurn Industries, Inc.; Jonespec Div.
7. Or approved equal

### B. General: ASME A112.21.3, key-operation hydrant with pressure rating of 125 psig.

1. Inlet: NPS 3/4 or NPS 1 threaded or solder joint
2. Outlet: ASME B1.20.7, garden-hose threads
3. Operating Keys: Two with each key-operation hydrant

### C. Non-freeze Exposed Hose Connection with Vacuum Breaker

1. Classification: Bronze nickel plated quarter turn non-freeze hydrant with 3/4" hose connection, integral vacuum breaker with vandal resistant cap and "T" handle key
2. Non-Freeze wall hydrant shall be Model No. 5609QT as manufactured by J.R. Smith or approved

## 2.04 DRAIN VALVES

### A. Hose-End Drain Valves: MSS SP-110, NPS 3/4 ball valve, rated for 400-psig minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded or solder joint
2. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap

### B. Hose-End Drain Valve: MSS SP-80, gate valve, Class 125, ASTM B 62 bronze body, with NPS 3/4 threaded or solder-joint inlet and ASME B1.20.7, garden-hose threads on outlet and cap. Hose bibbs are prohibited for this application.



## 2.05 MISCELLANEOUS PIPING SPECIALTIES

- A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
1. Manufacturers
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe; Wade Div.
    - d. Zurn Industries, Inc.; Specification Drainage Operation
    - e. Or approved equal
- B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig; integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.
1. Finish for Equipment Rooms: Rough bronze
  2. Finish for Service Areas: Chrome or nickel plated
  3. Finish for Finished Rooms: Chrome or nickel plated
  4. Operation for Equipment Rooms: Wheel handle or operating key
  5. Operation for Service Areas: Wheel handle
  6. Operation for Finished Rooms: Wheel handle
  7. Include operating key with each operating-key hose bibb
  8. Include integral wall flange with each chrome- or nickel-plated hose bibb
- C. Air Vents: Float type for automatic air venting.
1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded NPS 1/2 minimum inlet; 125-psig minimum pressure rating at 140 deg F; and threaded vent outlet.
- D. Roof Flashing Assemblies: Manufactured assembly made of 6-lb/sq. ft., 0.0938-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
1. Manufacturer: Acorn Engineering Company; Elmdor/Stoneman Div. or approved equal
  2. Open-Top Vent Cap: Without cap
  3. Low-Silhouette Vent Cap: With vandal-proof vent cap
  4. Extended Vent Cap: With field-installed, vandal-proof vent cap

- E. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting, joined with ASTM C 564, rubber gaskets.
- F. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- G. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- H. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.
- I. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

## 2.06 SLEEVE PENETRATION SYSTEMS

- A. Manufacturer: ProSet Systems, Inc. or approved equal.
- B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
  - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
  - 2. Stack Fitting: ASTM A 48, gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
    - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

## 2.07 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  - 1. General Use: 4-lb/sq. ft., 0.0625-inch thickness
  - 2. Vent Pipe Flashing: 3-lb/sq. ft., 0.0469-inch thickness
  - 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness

- B. Copper Sheet: ASTM B 152, of the following minimum weights and thicknesses, unless otherwise indicated:
  - 1. General Applications: 12 oz./sq. ft..
  - 2. Vent Pipe Flashing: 8 oz./sq. ft..
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness
- E. Fasteners: Metal compatible with material and substrate being fastened
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic

## 2.08 CLEANOUTS

- A. Comply with ASME A112.36.2M ASME A112.3.1.
- B. Cleanouts shall conform to the features of the cleanouts contained in the schedule below. The manufacturer's numbers are for the purpose of type only. The Contractor shall submit manufacturer product technical data for each type required before installation for approval.
  - 1. Gasket seal plugs will not be accepted in place of taper thread plugs.
- C. Cleanout plugs shall be bronze and countersunk type with taper screw threads.
- D. Cleanouts for cast iron pipe and galvanized steel pipe in exposed horizontal runs and accessible hung ceilings shall be as follows:
- E. Cleanouts for membrane waterproof floors shall be furnished with an integrally cast flashing flange with flashing clamp. Cleanouts in unfinished areas shall have cast iron tops and covers and in finished areas shall have nickel bronze tops and covers.

## Cleanout Schedule:

<u>Location</u>	<u>Piping</u>	<u>Figure Number</u> Or Approved Equal
Wall	Exposed Cast Iron	Smith 4420 Wade W-8550-D MIFAB C1450
Wall	Exposed Steel	Smith 4470 Wade W-8590-D MIFAB C1430
Wall	Concealed Cast Iron	Smith 4532-U Wade W-8460-R MIFAB C1460RD-6
Wall	Concealed Steel	Smith 4472-U Wade W-8590-E MIFAB C1430-RD-6
Floor-Concrete	Steel or Cast Iron	Smith 4248-U Wade W-6010-Z MIFAB C1100-XR
Floor-Asphalt Tile	Cast Iron	Smith 4168-U Wade W-6010-TS MIFAB C1100-TS
Floor-Terrazzo	Cast Iron	Smith 4188-U Wade W-7040-U MIFAB C1100
Floor-General Finished Area	Cast Iron	Smith 4028-U Wade W-6010-TS MIFAB C1100
Outside Grade Cast		Smith 4258 Wade W-8300-MF FAB C1300 w/C1230

## F. Cleanouts and Cleaning Screw Plugs for Acid Drainage Piping

1. Cleanouts flush with floor shall be silicon iron. All other cleanouts shall be of the same materials and by the same manufacturer as the piping to which they are connected.

2. Wall access covers shall be Jay R. Smith Fig. 4735-NB-U, Wade W-8480-S-5 or MIFAB C1400-S-1. Floor access cleanout covers shall Jay R. Smith Fig. 4930-U, Wade W-8300-S-1-5 or MIFAB C1300-S-1. Provide spanner type vandal proof screws for access covers.

## 2.09 FLOOR DRAINS

- A. Type A: (Toilet Room/Shower stall drains) shall be cast iron with double drainage flange and seepage openings, bottom outlet connection, flashing clamp device, and 6" round adjustable strainer of high polished brass or bronze. Individual shower compartments use a 6" round adjustable strainer of high polished nickel bronze. Drains shall be Smith 2010-A, Zurn Z-415-103-VP, Josam 30000-6A-X (shower), Josam 30000-6A-2-X (toilet), Wade W-1100 or MIFAB F1000C.
- B. Type B: (Boiler Room, Mechanical Spaces, Meter Rooms) shall be cast iron, triple drainage, bottom outlet caulk connection, medium duty round grate and slotted sediment bucket with 3/8" or 1/4" bottom drainage openings, so designed that grate cannot be set unless bucket is in position. Drains shall be Smith 2230, Zurn Z-540-Z-VP, Wade W-1210-TD, Josam 32220-17-X or MIFAB F1340-Y-14-5.
- C. Type C: (Tipping Floor, Pier Level) shall be cast iron, flashing collar, adjustable top, seepage opening, removable cast iron deep sediment bucket, seepage opening, caulk opening, slotted heavy duty cast iron grate, H2O loading, Smith Fig. No. 2488 or approved equal.
- D. Type D: Same (Loading Floor Level) same as Type C except with diamond plate non-skid hinged cover plate with lifting handle. Smith Fig. No SQ-2-2289 or approved equal.
- E. Type E: (Ejector Room) shall be cast iron drain with stainless steel 4" funnel, triple drainage, bottom outlet caulk connection, medium duty round grate and slotted sediment bucket with 3/8" or 1/4" bottom drainage openings, so designed that grate cannot be set unless bucket is in position. Drains shall be Smith 2230 & 9703 or approved equal.

## 2.10 TRENCH DRAINS

- A. Trench shall be aqueduct type, built in continuous 0.25% channel slope as indicated on drawings.
- B. Trench drain channels shall be manufactured from fiberglass reinforced plastic.
- C. Fiberglass channel shall have an interior surface coefficient or roughness of 0.010.
- D. Grating shall be manufactured of ASTM A536 ductile iron and certified to a proof loading of 200,000 lbs. Grating shall have a minimum open area of 40 square inches per linear foot.

- E. Grates shall be locked down on each side with stainless steel bolts at least  $\frac{1}{2}$ " diameter spaced a maximum of 18" on center.
- F. Grate frames shall be fabricated from Z-profile shapes made from  $\frac{1}{4}$ "-thick ASTM A36 steel with compatible headed stud concrete anchors on both sides spaced a maximum of 18" on center. Grate frames shall be of all welded construction, coated in conformance with the provisions of Section 09967. Exposed edges of frame facing trench shall be ground to a radius of  $\frac{1}{8}$ ". Rear edges of frame facing concrete shall be beveled to a bevel face of 0.05 inches with no fins either side of edge.
- G. Joints between channels shall be sealed during installation with polyurethane joint sealant as furnished by the trench drain system manufacture.
- H. Trench drain shall be Aquaduct Custom 8" as Manufactured by Aquaduct, Inc. meeting the above requirements, or approved equal.
- I. Submit detail shop drawing for approval prior to fabrication.

## 2.11 GUTTER DRAINS

- A. Terrace Drains: Comply with ASME A112.21.2M.
  - 1. Application: Gutter drains
  - 2. Product: Smith, Jay R. Mfg. Co.; DX-1010 or approved equal
  - 3. Delete features below if not required
  - 4. Body Material: Duct Cast iron
  - 5. Dome Material: Polyethylene
  - 6. Size: 20" diameter wide flange
  - 7. Combination Flashing Ring and Gravel Stop: Not Required
  - 8. Outlet: Bottom
  - 9. Sump Receiver: Required
  - 10. Dome: Required
  - 11. Extension Collars: Required
  - 12. Underdeck Clamp: Required

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Refer to Section 15050 - Basic Mechanical Materials and Methods for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  - 1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
  3. Do not install bypass piping around backflow preventers.
  4. Install all backflow preventers in accordance with New York City Department of Environmental Protection.
- C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.
- D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.
- E. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 degrees.
  3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  4. Locate at base of each vertical soil and waste stack.
- F. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- G. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- H. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- I. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- J. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- K. Install trench drains system in strict accordance with manufacture's recommendations. Submit detail shop drawing for approval prior to beginning the installation.

- L. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  - 1. Position floor drains for easy access and maintenance.
  - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    - a. Radius 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    - b. Radius 30 to 60 Inches: Equivalent to 1 percent slope.
    - c. Radius 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
  - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- M. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
  - 1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
  - 2. Position roof drains for easy access and maintenance.
- N. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- O. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- P. Install wood-blocking reinforcement for wall mounting and recessed-type plumbing specialties.
- Q. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Section 15112 - Valves Smaller than 4 Inches for general-duty ball, butterfly, check, gate, and globe valves.
- R. Install air vents at piping high points. Include ball, gate, or globe valve in inlet and drain piping from outlet to floor drain.



- S. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- T. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

### 3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.
- D. Ground equipment.
- E. Connect plumbing specialties and devices that require power according to Division 16 Sections.

### 3.03 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft., 0.0625-inch thickness or thinner.
  - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
  - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.

- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07620 - Sheet Metal Flashing and Trim.
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.04 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer.
  - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
  - 2. Refer to Section 15076 – Piping and Equipment Identification for nameplates and signs.

3.05 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

-END OF SECTION-

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**Section 15444**  
**PACKAGE BOOSTER PUMPS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes constant-speed, triplex, packaged booster pumps for domestic water piping systems.

**1.02 SUBMITTALS**

- A. **Product Data:** For each packaged booster pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.
- B. **Shop Drawings:** For packaged booster pumps and accessories. Include plans, elevations, sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  2. **Design Calculations:** Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  3. **Vibration Isolation Base Details:** Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails and equipment mounting frames.
  4. **Wiring Diagrams:** Detail power, signal, and control wiring.
- C. **Manufacturer Seismic Qualification Certification:** Submit certification that packaged booster pumps, accessories, and components will withstand seismic forces. Include the following:
1. **Basis for Certification:** Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  2. **Dimensioned Outline Drawings of Equipment Unit:** Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- D. Operation and Maintenance Data: For each packaged booster pump to include in emergency, operation, and maintenance manuals.

#### 1.03 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged booster pumps and are based on the specific system indicated.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Comply with ASME B31.9 for piping.
- D. Packaged booster pumps shall be listed and labeled as pumping systems by testing agency acceptable to authorities having jurisdiction.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

#### 1.05 COORDINATION

- A. Coordinate size and location of concrete bases with the Structures and Equipment Contractor.

### PART 2 PRODUCTS

#### 2.01 CONSTANT-SPEED, MULTIPLEX PACKAGE BOOSTER SYSTEM, (A-DWP-01) A-DWP-1A, A-DWP-1B, A-DWP-1C

- A. Manufacturers
  - 1. Alyan Pump Company
  - 2. Federal Pump Corp.
  - 3. Amtrol Inc.
  - 4. Hydronic Modules Corporation
  - 5. Paco Pumps, Inc.
  - 6. Thrush Company, Inc.
  - 7. Tigerflow, Inc.
  - 8. Or approved equal
- B. Description: Factory-assembled and -tested, packaged booster pump with multiple pumps, piping, valves, sensors, and controls on skids or base.

- C. Furnish and install where shown on the plans and pump schedule. Factory assembled water booster system on a common steel base with vibration isolators or approved equal. It shall include 3 close-coupled bronze fitted end suction centrifugal pumps.
- D. The 2 main pumps shall have a 1-1/2" combination pressure and check valve and the size of the jockey pump shall be 1-1/2" combination pressure and check valve. Each pump shall have shut-off isolation valves and on the discharge size of each pump there shall be a pressure gauge. The pressure and check valves and shut-off valves shall face the front of the unit, which is the motor end of the pumps. The suction and discharge headers shall be 2-1/2" copper with flanged connections. Shipped loose shall be two 2-1/2" Model SF stainless steel flexible connectors, 18" long each. Each header shall be provided with a pressure gauge and the discharge header shall include a mercoird pressure switch to operate the pumps. Each pump shall be provided with a temperature and purge valve, which will be piped to the nearest floor drain.
- E. The Unit shall include a Federal Pump Corp. Model FXA-500, 132 Gal. Cushion Stop Tank with rating of 125 psi and carry an ASME Label. The size of the tank shall be 30" Dia. x 57" High. This tank will operate off the jockey pump with a separate pressure switch and gauge. The Unit shall be factory assembled on a common steel base with vibration isolators.
- F. The unit shall include a mounted and wired NEMA-1 Triplex Control Panel. The bottom of the panel shall be mounted at the same level as the discharge header. In no way shall the panel obstruct the pump piping and instrumentation. The panel will include 3 circuit breakers, 3 magnetic starters, 3 HOA selector switches, 3 pilot lights, 1 alarm section with red light, bell and silencer, 1 lead-lag manual transfer switch, required transformers, holding circuits, time delays, terminal switch and main pump control pressure switch, low-suction pressure cut-out switch with front panel, indicator light and required circuitry to stop the pumps, if the suction pressure drops below a predetermined minimum level. The panel shall include a lead pump failure circuit, which will automatically make the next pump the lead pump. The panel shall include automatic alternation every 24 hours for the 2 main pumps.
- G. The jockey pump shall operate continuously and its control valve shall maintain the systems pressure. As water demand in the building increases beyond the ability of the jockey pump to satisfy it, the system pressure will drop, causing the lead main pump to start and operate in parallel with the jockey pump. After a set time delay period, the second main pump will start and operate in parallel with the other 2 pumps. After a set minimum time, or when the demand in the building drops sufficiently to allow the jockey pump to satisfy it alone, the main pumps will shutdown. The operating sequence of the main pumps shall alternate every 24 hours.
- H. The manufacturer shall include start-up and instructions and warrantee the entire unit, both labor and material, for one year against factory defects.
- I. See drawings for Package Booster Pump schedule.

- J. The unit shall have the New York Approval MEA NO.7 41-50SA.

## 2.02 FLEXIBLE CONNECTORS

### A. Manufacturers

1. Anamet, Inc.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries.
4. Flex-Pression, Ltd.
5. Flex-Weld, Inc.
6. Hyspan Precision Products, Inc.
7. Mercer Rubber.
8. Metraflex, Inc.
9. Proco Products, Inc.
10. Tozen America Corporation.
11. Unaflex Inc.
12. Or approved equal

- B. Description: Corrugated, bronze inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze-welded to tubing. Include 150-psig minimum working-pressure rating and ends according to the following:

1. NPS 2 and Smaller: Threaded. Provide flanged ends if pump has flanged connections.
2. NPS 2-1/2 and Larger: Flanged.

## 2.03 BUILDING-AUTOMATION-SYSTEM INTERFACE

- A. Provide auxiliary contacts in pump controllers for interface to building SCADA system. Contacts shall be SPDT, rated 5A at 120 Volts, contacts to relay all alarms conditions as a single group "Trouble" alarm signal Include the following:

1. Low pressure of each pump.
2. Failure of any pump

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine roughing-in for packaged booster pumps to verify actual locations of connections before booster pump installation.

### 3.02 BOOSTER PUMP INSTALLATION

- A. Install packaged booster pumps level on concrete bases with access for periodic maintenance including removal of pumps, motors, impellers, couplings, and accessories.
  - 1. Do not dismantle packaged booster pumps or remove individual components.
- B. Vibration Isolation: Install on spring isolators with minimum deflection of Vibration isolation devices.
- C. Support connected domestic water piping so weight of piping is not supported by packaged booster pumps.

### 3.03 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect domestic water piping to packaged booster pumps. Install suction and discharge pipe equal to or greater than size of unit suction and discharge headers piping.
  - 1. Install flexible connectors on piping connections to unit suction and discharge piping. Install flexible connectors same size as piping.
  - 2. Install shutoff valves on piping connections to each booster pump suction and discharge headers piping. Install ball, or gate valves same size as suction and discharge headers piping. General-duty valves are specified in Section 15110 - Plumbing Valves.
  - 3. Install union or flanged connections on pump suction and discharge headers piping at connection to domestic water piping.
  - 4. Install piping adjacent to packaged booster pumps to allow service and maintenance.
- C. Ground equipment according to Section 16060 - Grounding.
- D. Connect wiring according to Section 16121 - Wires and Cables - 600 Volt and Below.

### 3.04 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform the following startup service:
  - 1. Complete installation and startup checks according to manufacturer's written instructions.



2. Check piping connections for tightness.
  3. Clean strainers if any.
  4. Verify that pump controls are correct for required application.
- B. Perform the following startup checks for each pump of packaged booster pump unit before starting:
1. Verify bearing lubrication.
  2. Prime pumps by opening suction valves and closing discharge valves, and prepare pumps for operation.
  3. Start motors.
  4. Open discharge valves slowly.
  5. Adjust settings.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting packaged booster pumps to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

### 3.05 LABELING AND IDENTIFICATION

- A. Install identifying equipment markers and equipment signs on booster pumps. Labeling and identification materials are specified in Section 15076 – Piping and Equipment Identification.

### 3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain packaged booster pumps. Refer to Sections 01781 – Project Closeout and 01821 - Training.

-END OF SECTION-

**Section 15486**  
**DOMESTIC WATER HEATERS**

**PART 1 GENERAL****1.01 SUMMARY**

A. This Section includes the following for domestic water systems:

1. Commercial, copper fin tube gas water heaters with storage tank
2. Commercial, instantaneous water heater
3. Commercial, electric water heaters
4. Accessories

**1.02 SUBMITTALS**

- A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.
- C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
- D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

**1.03 QUALITY ASSURANCE**

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Section 01631 – Equivalent Materials and Equipment.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- D. ANSI Compliance: Provide gas water heaters that comply with ANSI standards for gas water heaters and related products and that bear AGA certification label.
- E. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- F. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
  - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
  - 2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

#### 1.04 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive the City of New York of other rights the City of New York may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
  - 1. Failures include storage tanks, circulators, burner assemblies.
  - 2. Warranty Period: From date of Substantial Completion:
    - a. Storage Tanks: 10 years
    - b. Circulators: Eight years
    - c. Burner Assemblies: Five years

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. Commercial, Storage, Atmospheric-Vent, Gas Water Heaters:
    - a. American Water Heater Co.
    - b. Bock Water Heaters, Inc.
    - c. Bradford White Corp.
    - d. Lochinvar Corp.

- e. Rheem Manufacturing Co.; Rheem Water Heater Div.
- f. Smith: A. O. Smith Water Products Co.
- g. Or approved equal

2.02 DOMESTIC HOT WATER HEATER PACKAGE SYSTEM. A-HWH-01.

- A. The domestic hot water heater shall be a package system, as shown on the Drawings. Package system shall consist of a water heater, a jacketed and insulated lock temp Storage Tank, an all bronze circulating pump, inlet and outlet ball valves and an ASME temperature and pressure relief valve. Entire assembly shall be pre piped, assembled and skid-mounted, pressure tested and ready for installation. Components shall be as follows:

1. The water containing section shall be of a "Fin Tube" design, with straight pure copper tubes having extruded integral fins spaced seven (7) fins per inch. The tubes shall be securely rolled into a one piece, glass-lined, cast iron header. There shall be no bolts, gaskets or "O" rings in the header configuration. There shall be free access to either end of the heat exchanger for purposes of inspection, cleaning, or repair. The heat exchanger shall be mounted on a stress free jacket assembly in order to provide a "free floating" design, able to withstand the effects of thermal shock. The water heater shall bear the ASME "HLW" stamp for 160 psi working pressure and shall be National Board listed. The complete heat exchanger assembly shall carry a three (3) year limited warranty against failure caused by defective workmanship or material. The water heater shall be equipped with a factory installed circulating pump of sufficient capacity to ensure scale free performance. The pump shall be all bronze and provided for operation on 120 volt, 60 cycle, 1 phase power supply.
2. The combustion chamber shall be enclosed with a high temperature resistant, 1" thick, "Loch Heat™" ceramic fiberboard insulation which shall be modular for ease of replacement in sections. The burners shall be constructed of stainless steel and fire on a horizontal plane.
3. The water heater shall be constructed with a heavy gauge galvanized steel jacket assembly, primed and pre-painted on both sides with a minimum dry film thickness of 0.70 mills. The unit shall have a built in draft diverter contained entirely within the jacket, and requiring no additional external draft hood devices.
4. The water heater shall be certified and listed by CSA International under the latest edition of the harmonized ANSI Z21.10.3 test standard for the US and Canada. The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The water heater shall operate at a minimum of 82% thermal efficiency.
5. Standard operating controls and equipment shall include 100% safety pilot shutdown, dual adjustable high limit controls, and combination gas valve

with redundant seats, main and pilot gas regulators, 24-volt control circuit, ASME temperature and pressure relief valve. The manufacturer shall verify proper operation of the burners, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping. A quality test report shall be shipped with each unit.

6. The Firing Control System shall be with intermittent spark ignition with Electronic Flame Supervision.
  7. The circulating pump shall be all bronze and operate on a 120 volt, 60 cycle, 1 phase power supply. The pump shall be wired to run with intermittent pump operation.
  8. Storage tank shall be a vertical Lochinvar tank having a storage capacity as indicated on drawings. The tank shall be constructed with an inner chamber designed to receive all circulation to and from the water heater. The baffled tank shall supply 80% of tank capacity without a drop in outlet temperature. A-HWS-01.
  9. The storage tank shall be constructed in accordance with ASME requirements, if ASME, stamped and registered with the National Board of Boiler and Pressure Vessel Inspectors. The storage tank shall have a working pressure of 125 psi standard for ASME tanks. The storage tank shall be glass lined and fired to 1600°F to ensure a molecular fusing of glass and steel, and carry a five (5) year warranty. The tank shall be constructed with a heavy gauge galvanized steel jacket assembly, primed and pre-painted on both sides with a minimum dry film thickness of 0.70 mils. The jacket and tank base shall be a watertight construction with a built-in drain pan, complete with a 3/4" drain connection to assist in protecting against damage in the event of a tank or component leakage. The Storage Tank shall be completely encased in high-density insulation of sufficient thickness to meet the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The entire assembly shall be mounted on "T" beam skids to facilitate handling and installation.
- 2.03 INSTANTANEOUS SINGLE POINT ELECTRIC WATER HEATER, A-HWH-02, A-HWH-03.
- A. Instantaneous water heaters shall be as shown on the drawings.
- 2.04 COMMERCIAL, POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS A-HWH-04, A-HWH-05, A-HWH-06.
- A. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.

- B. Storage Tank Construction: ASME-code steel with 150-psig working-pressure rating.
  - 1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
  - 2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
  - 3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
  - 4. Jacket: Steel, with enameled finish.
- C. Heating Elements: Two, unless otherwise indicated; electric, screw-in, immersion type.
  - 1. Temperature Control: Adjustable thermostat.
- D. Anode Rod: Factory installed, magnesium.
- E. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.
- F. Energy cut-off: shuts off electrical power should the water temperature in tank reach 205°F.
- G. Temperature, pressure relief valve and gauge.
- H. High and low water pressure limit switches
- I. Handhole cleanout.
- J. Hinged access door
- K. See schedule on drawing for size.
- L. Provide electric contact for SCADA system.

## 2.05 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: According to the following:
  - 1. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.

2. Option: Separate temperature and pressure relief valves are acceptable instead of combination relief valve.
  3. Exception: Omit combination temperature and pressure relief valve for tankless water heater, and furnish pressure relief valve for installation in piping.
- B. Pressure Relief Valves
1. Gas Water Heaters: ANSI Z21.22 pressure relief valve for storage tanks of 200,000 Btuh.
- C. Vacuum Relief Valves
1. Gas Water Heaters: ANSI Z21.22.
  2. Exception: Omit if water heater has integral vacuum-relieving device.
- D. Gas Shutoff Valves: ANSI Z21.15, manually operated. Furnish for installation in piping.
- E. Gas Pressure Regulators: ANSI Z21.18, appliance type, factory or field installed. Include pressure rating, capacity, and pressure differential required for water heater and gas supply.
- F. Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.
- G. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

### PART 3 EXECUTION

#### 3.01 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Anchor water heaters to substrate.
- D. Install seismic restraints for water heaters. Anchor to substrate.

- E. Install and connect gas water heaters according to NFPA 54.
  - 1. Install appliance, gas pressure regulators on gas-burner inlets of water heaters without pressure regulators.
- F. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- G. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- H. Install vacuum relief valves in cold-water-inlet piping.
- I. Install vacuum relief valves in water heater storage tanks that have copper lining.
- J. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Section 15430 "Plumbing Specialties" for drain valves.
- K. Install thermometers on water heater inlet and outlet piping. Refer to Section 15122 - Meters and Gages for thermometers.
  - 1. Exception: Omit thermometers for the following:
    - a. Commercial, point-of-use, water heater inlet piping.
- L. Install pressure gages on water heater piping. Refer to Section 15122 - Meters and Gages for pressure gages.
- M. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.
- N. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- O. Fill water heaters with water.

### 3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.



- C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- D. Connect gas piping to gas burner with drip leg, tee, shutoff valve, and union; minimum size same as inlet connection.
- E. Make connections with dielectric fittings where piping is made of dissimilar metal.
- F. Gas, Water Heater Vent Connections: Connect to vent system. Include draft hoods and diverters where required. Use vents same size as or larger than water heater outlets, but not smaller than indicated unless smaller vent size has been calculated according to NFPA 54. Comply with gas utility requirements for sizing. Gas vents are specified in Section 15550 - Breechings, Chimneys, and Stacks.
- G. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.
- H. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.03 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to perform startup service.
- B. In addition to manufacturer's written installation and startup checks, perform the following:
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
  - 2. Verify that piping system tests are complete.
  - 3. Check for piping connection leaks.
  - 4. Check for clear relief valve inlets, outlets, and drain piping.
  - 5. Check operation of circulators.
  - 6. Test operation of safety controls, relief valves, and devices.
  - 7. Energize electric circuits.
  - 8. Adjust operating controls.

9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain water heaters.
  1. Train the City of New York's maintenance personnel on procedures for starting and stopping trouble-shooting, servicing, and maintaining equipment. Refer to Section 01821 - Training
  2. Review data in maintenance manuals. Refer to Section 01781 - Project Closeout.
  3. Review data in maintenance manuals. Refer to Section 01831 - Operation and Maintenance Manuals.
  4. Schedule training with the City of New York with at least seven days' advance notice.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 15540**  
**FUEL FIRED HEATERS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Indirect gas fired heat modules, and high intensity infrared heaters, their accessories and controls as required for a complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15071 - Vibration Control
- B. Section 15190 - Fuel Gas Piping
- C. Section 15550 - Breechings, Chimneys and Stacks
- D. Section 15551 - Chimney Automation System
- E. Section 15810 - Ductwork
- F. Section 15900 - HVAC Controls
- G. Section 15950 - Testing, Adjusting and Balancing
- H. Section 16220 - Electric Motors

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
  - 2. NFPA 211 - Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
  - 3. ANSI Z223.1 - National Fuel Gas Code
  - 4. MIL WW-F-2743 - Furnaces, Warm Air Heaters, Unit Forced Air Circulation, Oil- and Gas-Fired
  - 5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Section 01330 - Shop Drawings.
- B. Product Data: Submit catalog product data indicating rated capacities, dimensions, weights, accessories, materials and finishes, electrical requirements, and wiring diagrams.

- C. Shop Drawings: Submit shop drawings indicating assembly, equipment locations, required clearances, and location and size of field connections.
- D. Operation and Maintenance Data: Submit manufacturer's descriptive literature including installation and operation instructions, controls, accessories, maintenance and repair data and parts listing.

#### 1.05 QUALITY ASSURANCE

- A. Provide equipment from company specializing in design and manufacture of fuel-fired heaters which has a minimum of three (3) years documented experience and issues complete catalog data on these products.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Storage and Protection: Store products in their original shipping containers, with labeling in place until time of installation. Store products in clean, dry place and protect from physical damage.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Indirect Gas Fired Heat Modules
  - 1. The Trane Co.
- C. High Intensity Infrared Heaters
  - 1. Reznor
  - 2. Roberts Gordon, Inc.

#### 2.02 MATERIALS

- A. General: Provide factory assembled fuel fired heaters tested and finished, with all accessories necessary for a complete installation.

- B. Indirect Gas Fired Heat Modules: Provide indirect gas fired heating sections of size, capacity and arrangement shown and schedule meeting the following requirements:
1. The gas heat section shall be natural gas, indirect fired and shall be completely factory assembled, wired and tested at the factory before shipment. The indirect gas heater consists of the heat exchanger, power burner, gas train, flame management controls and control panel. The section shall bear UL label for Industrial Gas Heating Equipment ANSI/UL Standard 749 and Industrial Gas fired Package Units (CGA Standard 3.2-1976). It shall have double wall construction with fiberglass insulation and a burner access door on the same side as the fan motor access. All burner and control components shall be housed in the burner vestibule complete with a combustion air intake louver. It is an integral part of the entire air-handling system.
  2. The drum-and-tube heat exchanger shall be constructed of 14-gauge 409 stainless steel on both the primary and the secondary surfaces. The heat exchanger shall be a two-pass design for 200 - 1150 MBh and a four-pass design for 1250 - 2500 MBh. Both primary and secondary surfaces shall be constructed of a minimum of 14-gauge welded 409 stainless steel. Lighter metal gauges and non-stainless steel components will not be acceptable. Tubes shall be fitted with multi-plane metal turbulators. The heat exchangers shall be fitted with a flame viewing port and cleanout plate to facilitate cleaning and inspection of tubes and tubulators. A condensate drain connection shall be piped to the nearest floor drain.
  3. The burner shall be an industrial forced draft, full modulating type capable of efficient firing over its operating range without producing excessive CO, CO<sub>2</sub> or NO<sub>x</sub>. It shall be fitted with a combustion air damper assembly for control of fuel-air ration through its modulating range. The burner shall use a modulating gas valve design to provide precise capacity control. The combustion air damper and modulating gas valve shall be linked either internally or through a control linkage that is factory preset. Step-controlled gas valves and/or two-speed fan motors will not be acceptable. The burner shall have a low fire start interlock. A stainless steel multi-port diffuser and flame retention firing head combine to produce full-range, stable performance. The burner is equipped with a integrally mounted direct drive combustion blower, internal thermal overload protection and combustion air damper, which controls the fuel-air ration throughout the modulating range for efficient turndown. The burner shall be manufactured by Eclipse, Maxon, Power Flame, or approved equal, and be designed to fire natural gas with turndown ration of 10:1.
  4. The combustion blower shall be centrifugal type direct drive, capable of delivering the proper amount of combustion air to the burner nozzle. The blower motor shall have an internal thermal overload protection and an air

proving switch shall be mounted on the scroll, interlocking burner operation with the gas train controls to prevent burner operation when the combustion air fan is shut down. Where shown provide an induced draft exhaust fan for positive venting of combustion products. The induced draft fan shall be centrifugal type, capable of withstanding high temperatures associated with flue gas.

5. The heating section shall use a Honeywell 7800 series or approved equal flame relay to provide the flame safeguard programming. The flame relay shall have annunciation lights indicating pilot on, safeties satisfied, combustion airflow and flame failure. The flame relay shall have a pre-purge cycle, providing for a minimum of four air changes in the heat exchanger before ignition. An ultraviolet (UV) flame detector senses the presence of a flame. The flame relay shall have a spark-ignited gas pilot system to establish an intermittent pilot. The ignition transformer shall provide a 6000-volt spark.
6. The standard gas train shall meet UL and FM requirements and shall be Industrial Risk Insurers (IRI) approved designed for 7-14 in. WC incoming gas pressure. It components include the following:
  - a. Primary automatic gas safety shutoff valve with pressure taps
  - b. Gas pressure regulator
  - c. Secondary redundant automatic gas safety shutoff valve (above 400 MBH)
  - d. Modulating gas valve
  - e. Main gas shutoff valve with pressure tap and second ball shutoff cock
  - f. Gas pressure taps for servicing and adjusting burner
  - g. Pilot solenoid
  - h. Pilot gas pressure regulator
  - i. Pilot solenoid valve
  - j. Orifice plate
  - k. High gas pressure safety switch
  - l. Low gas pressure safety switch
  - m. Pilot gas pressure regulator

- n. Pilot gas solenoid
  - o. Pilot gas manual shutoff valve
7. The gas operating and safety controls shall include the following:
- a. Modulating actuator to drive the gas control valve and the combustion air damper
  - b. Electronic flame relay with UV flame sensor
  - c. High conditioned air temperature limit
  - d. Conditioned air flow interlock
  - e. Combustion air flow interlock
  - f. Low fire start relay
  - g. Control power transformer that allows the gas heat section to be powered by the same 3-phase voltage as the supply fan.
  - h. Digital readout annunciation module for flame relay. This consists of a plug-in module for the flame relay featuring two-line digital English language readout of over 50 parameters.
8. The flame relay shall be Honeywell Model 7895A or approved equal and shall be equipped with annunciation lights indicating pilot on, safeties satisfied, combustion airflow and flame failure. The unit shall have a purge cycle that provides a minimum of four air changes of the heat exchanger interior. The purge time shall not exceed four minutes. The heating system shall have an intermittent spark ignition to establish the pilot flame. The unit shall be programmed to start in low-fire mode.
9. The burner control panel is mounted in the burner vestibule. It houses the incoming power terminal block, circuit breaker, low start relay and numbered terminal strips. All wiring shall be factory pre-wired in flex conduit and numbered for ease of service. A circuit breaker serves as a disconnecting device and overcurrent protection.
10. Field connections shall required only main power (120 VAC or 3-phase with inducted draft fans), a heat start contact closure and a modulating 0-10 VDC (or optional 4-20 mA) signal.
- C. High Intensity Infrared Heaters: Provide infrared gas fired, high-intensity heaters to operate with natural gas with a 115 volt supply voltage approved by the



American Gas Association of the minimum size, heating and arrangement, meeting the following requirements:

1. Provide burner control system to have a direct spark ignition with a 100 percent safety shut-off and a solenoid gas valve with 1/2 inch N.P.T inlet.
2. Control unit operation as specified in Section 15900 - HVAC Controls.
3. Heater shall be of compact modular design and rugged construction consisting of the controls; a seamless aluminized steel plenum chamber with stainless steel ceramic tile retainer clips; surface combustion ceramic burner capable of full intensity temperature in less than 30 seconds; venturi mixer of spun metal construction for precision metering of air/gas mixture; highly polished parabolic reflector; balanced suspension holes; wire grid; and heat deflector shield.
4. The burner assembly shall be removable for cleaning or replacement. The ceramic combustion surface shall reach temperatures up to 185 degrees F and shall be design with alternating rows of precision perforations producing a shorter stable flame.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. General: Examine gas-fired heaters at time of delivery for damaged or missing components. Do not proceed with installation of units until all items found defective have been corrected.
- B. Power Supply: Verify that proper power supply is available.
- C. Gas Supply: Verify that proper gas supply is available for connection.

#### 3.02 INSTALLATION

- A. General: Install all units in accordance with manufacturer's instructions. Make all necessary adjustments to provide complete and satisfactory operation upon completion of installation.
- B. Vent Connections: Provide vent connections in accordance with requirements specified in Section 15550 - Breechings, Chimneys and Stacks.
- C. Vibration Controls: Install units with vibration isolation in accordance to Section 15071 - Vibration Control.
- D. Thermostats: Install thermostats in accordance with Section 15900 - HVAC Controls.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of qualified representative of manufacturer as specified in Division 1 to inspect installation of equipment, certify that it met manufacturer's recommendations, and instruct operating personnel in its operation and maintenance.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15550**  
**BREECHINGS, CHIMNEYS, AND STACKS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Metal breechings, chimneys, stacks and vents and accessories for gas fired appliances.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15081 - Piping Insulation  
B. Section 15060 - Hangers and Supports  
C. Section 15540 - Fuel Fired Heaters

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
1. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  2. ANSI Z223.1 - The National Fuel Gas Code
  3. ASHRAE - Handbook, Equipment Volume, Chapter "Chimney, Gas Vent, and Fireplace Systems"
  4. NFPA 82 - Incinerators, Waste and Linen Handling Systems and Equipment
  5. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
  6. SMACNA - HVAC Duct Construction Standards - Metal and Flexible
  7. UL 103 - Standard for Factory Built Low Heat Chimneys
  8. AWS D9.1 - Specifications for Welding Sheet Metal

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit product data including materials, dimensions, weights, and accessories.

- C. Shop Drawings: Submit shop drawings drawn to scale of not less than 1/4 inch representing one foot showing plans and sections, including required clearances, expansion flashing and counter-flashing, rustproof materials and finishes, assembly and installation instructions, and support details of all components as complete system.
- D. Quality Control
  - 1. Certificates: Submit certificates of materials compliance with specified ASTM, UL, and ASHRAE requirements.
  - 2. Certificates: Submit Welders' Qualification Certificates.
  - 3. Certificates: Submit a complete engineering report certifying that stacks meet design wind and seismic loads.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide equipment from a company specializing in the manufacture of products specified in this Section with minimum three (3) years documented experience.
- B. Welder's Qualifications: Certify all welders in accordance with AWS Standard D9.1.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Single Wall Breeching Expansion Joints
  - 1. Metraflex Co.
- C. Breeching, Gas Vents, Chimneys and Stacks
  - 1. Selkirk Metalbestos
  - 2. Van Packer

#### 2.02 MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard breechings, gas vents, chimneys and stacks where shown, of size and type indicated, constructed of materials and components as indicated, and as required for complete installation.

- B. Single Wall Breeching: Fabricate breechings of black hot rolled steel with welded seams in accordance with SMACNA standards for breechings.
1. Fabricate breechings from following minimum gauges:
    - a. Sizes up to 14 inches - 16 gauge
    - b. Sizes over 14 to 16 inches - 14 gauge
    - c. Sizes over 16 to 18 inches - 12 gauge
    - d. Sizes over 18 inches - 10 gauge
  2. Provide adjustable self-actuating barometric dampers, full size of breeching.
  3. Provide bolted type cleanout doors, same gauge as the breeching.
  4. Weld longitudinal seams. Provide end joints with gasketed and bolted companion angle flanges. Construct flanges of a minimum 1-1/2 by 3/16 inch steel angles.
  5. Provide bellows type breeching expansion joints and breeching anchors. Provide packless Type 316L stainless steel expansion joints with steel flanged ends. Fabricate bellows as a hydraulically formed tube with longitudinal seams only. Provide rectangular joints with camera or bevel type corners. Design expansion joints to flex not less than 5000 cycles as installed without failure. Do not use bellows with circumferential seams. Provide expansion joints suitable for temperature of 650 degrees F and maximum pressure of 5 psig, designed to absorb thermal expansion of breeching between anchor points.
  6. Reinforce rectangular breeching with angle frames and round breechings with flanged joints or angle frames. Refer to SMACNA HVAC Duct Construction Standards.
  7. Fabricate breeching fittings to match adjoining breechings. Fabricate elbows with centerline radius equal to breeching diameter. Limit angular tapers to 20 degrees maximum.
  8. Insulate breechings in accordance with the requirements of the specifications Section 15081 - Piping Insulation.
- C. Double Wall Prefabricated Gas Vents, Chimneys and Stacks: Provide double wall prefabricated metal gas vents, chimneys and stacks, tested to UL 103 and UL listed, for use with building heating equipment burning gas and fuels, in compliance with NFPA 211.
1. Fabricate the gas vents, chimneys and stacks with 1 inch minimum air space between the walls. Construct the inner jacket of 20 gauge ASTM A 167

Type 316 stainless steel. Construct the outer jacket of 316 stainless steel 24 gauge for sizes 10 to 24 inches and 20 gauge for sizes 28 to 48 inches.

2. Provide accessories each bearing factory applied UL label including insulated fittings, roof support assembly, ventilated roof thimble, storm collar with tall flashing to fit the concrete curb, full angle ring with required supporting steel, drained tee cap, a half angle ring with threaded support rods, insulated exit cone, and an adapter to match the outlet flange of the heating equipment.
3. Seal the joints with silicone sealant rated for 600 degrees F temperature. Assemble gas vent, chimney and stack sections with V-type draw bands and formed channel bands, bolted together with Type 316 stainless steel bolts.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install breechings, gas vents, chimneys and stacks in accordance with manufacturer's installation instructions and UL listing. Maintain minimum clearances from combustibles as specified in UL listing.
  1. Install products in accordance with the recommendations of ASHRAE - Handbook, Equipment Volume, Chapter "Chimney, Gas Vent, and Fireplace Systems", and ANSI Z223.1 (NFPA 54).
- B. Joints: Install breechings and gas vents with minimum number of joints. Align them accurately at connections, with internal surfaces smooth.
  1. Seal joints between sections of positive pressure gas vents in accordance with the manufacturer's installation instructions, and using only sealants recommended by manufacturer.
- C. Supports: Support breechings and gas vents from building structures, rigidly, with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support gas vents, chimneys and stacks to adjacent structural surfaces, or at floor penetrations at 12 foot spacing. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.
  1. Install concrete inserts for support of breechings, gas vents, chimneys, and stacks in coordination with formwork.
  2. Support gas vents at the intervals recommended by the manufacturer to support the weight of the vent and all accessories, without exceeding loading of appliances.
- D. Equipment Connection: Pitch breechings with positive slope up from the fuel-fired equipment to chimney or stack.

- E. Install gas fired equipment with separated combustion system, flue gas and combustion air terminal assembly, meeting requirements specified in Section 15540 - Fuel Fired Heaters.
- F. Stacks: Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Connect base section to foundation using anchor lugs.
  - 1. Install chimney level and plumb.
- G. Thermal Expansion: Install expansion joints on breechings, gas vents, chimneys and stacks, to allow for thermal expansion.
- H. Slip Joints: At appliances, provide slip joints permitting the removal of appliances without the removal or dismantling of breechings, gas vents, chimneys, or stacks.
  - 1. Provide a minimum of 2 feet of breeching or gas vent to connect appliances to chimneys.

### 3.02 ADJUSTING AND CLEANING

- A. General: Clean breechings and gas vents internally during installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth.

### 3.03 PROTECTION

- A. Temporary Closure: At ends of breechings, where gas vents and chimneys which are not completed or connected to equipment, provide a temporary closure to prevent the entrance of dust and debris until installations are completed.

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 15551**  
**CHIMNEY AUTOMATION SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Section includes Chimney Automation System and related equipment including the following:
  - 1. Packaged chimney fan/control combination, listed to UL378, Standard for Draft Equipment as a complete system
  - 2. Electrical connection
  - 3. Stack connection

**1.02 RELATED SPECIFICATIONS**

- A. Section 16055 - Electrical Requirements for Shop-Assembled Equipment

**1.03 REFERENCES**

- A. The following published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section:
  - 1. UL – Underwriters Laboratories
  - 2. National Electrical Code

**1.04 SUBMITTALS**

- A. Contractor shall coordinate equipment product data submittal sheets and shall provide a comprehensive set of interfaced drawings and stack design calculations, which shall serve as the basis for system evaluation by the Commissioner.
- B. Submit the following:
  - 1. Comprehensive set of mechanical venting calculations based on the Chimney Design Equation published in the ASHRAE Handbook. Calculations must show flue gas volumes, pressure losses and estimated temperatures in each section to assure compliance with fan temperature rating and prevent condensation, if appropriate.
  - 2. Chimney fan descriptive literature, dimensional diagram and electrical diagram
  - 3. Control descriptive literature, dimensional diagrams and electrical diagrams

4. Specification review with respect to submitted equipment identifying all areas of compliance and exceptions
5. Certification of listing by recognized testing laboratory

#### 1.05 QUALITY ASSURANCE

- A. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture and shall be a standard catalog product. The manufacturer must have a minimum of three (3) years documented experience.
- B. Draft system shall be guaranteed to operate satisfactorily and efficiently without objectionable smoke or odor.
- C. Scheduled equipment performance is minimum capacity required.
- D. Scheduled electrical capacity shall be considered as maximum available.
- E. Equipment shall be manufactured at ISO 9001 certified plant.

#### 1.06 MANUFACTURER'S WARRANTY

- A. All equipment shall be guaranteed against defects in materials and/or workmanship for a period of 24 months from the date of Substantial Completion. The warranty shall be provided by the equipment manufacturer and shall include the parts necessary to repair or replace all defective parts and materials.
- B. The chimney fan(s) shall be covered by a 10-year warranty against corrosion perforation.

#### 1.07 OPERATING AND MAINTENANCE MANUALS

- A. Provide complete Operation and Maintenance manuals with product literature on the chimney fan and controls, dimensional and wiring diagrams, in accordance with Section 01831 – Operation and Maintenance Manuals.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  1. Exhausto Inc.
  2. Tjernlund Products Inc.

## 2.02 CHIMNEY AUTOMATION SYSTEM DESIGN

- A. Furnish a fully redundant Appliance Draft Control System to ensure a flue pressure over the entire operating range of the all the appliances. All components shall be furnished as a complete system from a single manufacturer. System shall be fully redundant so that any failure of any control component shall automatically cause the standby unit to begin operation; this will ensure the heating plant stays operational at all times. The system, its application and functionality must be listed to UL378, Standard for Draft Equipment.
- B. The draft fan design must be a Type B, Spark Resistant Construction in compliance with AMCA Standard 99-0401. The draft fan shall have a removable motor assembly for easy motor, impeller and duct accessibility and be manufactured in a heat and corrosion resistant material, such as Type 316L stainless steel, rated for an operating temperature of 575°F (300°C) measured at the draft fan inlet point. The impeller must be 316L stainless steel or cast aluminum rated for condensing applications. Fan motor is to be three phase 208-230 or 460 VAC TEFC, permanently lubricated with sealed ball bearings and EPACT rated for energy efficiency. Fan is to be UL378 listed for use with condensing flue gases which shall be acknowledged in the installation manual. Fan temperature rating shall be at least 500°F at all operating speeds.
- C. Variable Frequency Drive (VFD) shall control the speed of the Draft Fan. The VFD must be factory programmed to the individual Draft Fan that it will control but shall not be part of the PID-loop. The VFD must be UL Listed and NEMA 12 rated. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for fan control and to eliminate the need for motor de-rating. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
- D. The modulating fan control must be a true PID-based control with infinitely variable speed settings and in a NEMA 12 rated enclosure. It must NOT be able to control or interfere with the operation of the heating appliances by delaying burner operation due to unstable draft conditions. Interference is only allowed during emergencies where a mechanical or electrical problem occurs. The control shall include a chimney probe along with tubing and a pressure transducer, for installation in the chimney or stack as shown on the manufacturer's submittal. The features must be part of the compliance with UL378, Standard for Draft Equipment and UL508, Standard for Industrial Controls:

1. Able to maintain a constant draft between 0.01 inch W.C. and 0.6 inch W.C. with a tolerance of no more than  $\pm 2\%$  when measured with an external manometer under stable load conditions.
2. Ramp-up and ramp-down time of no more than 20 seconds
3. "Plug-and-Play" self-check that detects connections, setting requirements and accessories during each start-up.
4. Programmable microprocessor for selective programming of, but not limited to, draft, intermittent vs. continuous fan operation, purge times, sensor sensitivity, alarm limits and delays, manual overrides, low/high limit fan speeds via the operating panel or the RS-232 port.
5. A standard board that interlocks with up to 6 gas fired units so a call for heat activates the draft fan and releases the burner once the pre-set draft has been established.
6. An integrated and programmable proven draft function that can be set for automatic and manual reset.
7. An integrated operating priority option, which allows one or more appliances to operate during electrical or mechanical failure of the fan, provided the draft requirement can be met and safe operation assured. Set up of a default operating priority must be possible, so the most important appliance(s) have highest priority during calls for heat. It must automatically check for fan operation every two hours and go back to normal operation if appropriate.
8. Bearing cycle activation every 7 days if the draft fan has not been operating during the past 7 day period.

E. Sequence of Operation

1. Upon a call for heat the appliance will satisfy all internal safeties, and before the gas valve is opened the call for heat will land at the controller so the draft fan can start. Once the proof of flow for the draft fan has occurred and the adjustable pre purge time delay has elapsed the controller will send the start command back to the appliance so the gas valve can open and the appliance can start. All appliances are to be interlocked with either (lead or lag) controller.
2. Upon normal appliance shut down the call for heat contact at the appliance will open. The controller will sense this and return the call for shut down back to the appliance. The controller will keep the draft fan operating for an adjustable post purge time delay to ensure all flue gases are evacuated.

3. Redundant control sequence of operation: For each control component listed above provide a duplicate unit, to be installed as a complete redundant system. The redundant system shall be fully commissioned at the time of the primary system. Program the two systems such that the main controllers monitor each other in so that if one should fail the other will automatically take over. Any failures (alarms) will close a contact that can be annunciated on the building automation system. Provide a means to isolate one draft fan from the other so only one fan is operating. This is to be accomplished with isolation dampers as shown on the drawings. A draft fan failure will cause the isolation damper for that unit to close and the standby unit to open. That draft fan will then start with a dedicated proof of flow switch, proving flow, allowing the appliances to fire. Failure of any one component, VFD, controller, press transducer or draft fan will cause the back up unit to begin operation and the alarm contact to close.

## 2.03 STACK CONNECTION

- A. Furnish slip connection type as required.

## 2.04 BALANCING BAFFLES

- A. Furnish balancing baffles, for each gas fired unit where specified by manufacturer.

## 2.05 ELECTRICAL REQUIREMENTS

- A. All wiring shall be furnished in accordance with the National Electrical Code and Section 16055 - Electrical Requirements for Shop-Assembled Equipment.

# PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Complete structural, mechanical, and electrical connections in accordance with manufacturers' printed instructions.
- B. Install all Chimney Automation System components as required, including low voltage wiring from pressure transducer to modulating fan control controller and line voltage wiring from modulating fan control to the chimney fan. Allow satisfactory arrangement in the space available.
- C. Connecting to Stack: Install as required and in accordance with manufacturer's printed instruction.

3.02 FIELD QUALITY CONTROL

- A. Provide services of the chimney automation system manufacturer to:
  - 1. Confirm proper installation of chimney fan and controls.
  - 2. Start-up and adjust control and balancing baffles.
  - 3. Test individual controls for proper operation.
  - 4. Set draft for specified operation.
  - 5. Test safety system
- B. Submit a written report signed by the manufacturer, confirming that safety and operating controls have been properly installed.

3.03 SYSTEM START-UP AND TRAINING

- A. System shall be started up and programmed and by a factory certified technician. Provide a report to the City of New York showing the system was properly commissioned and what the user adjustable parameters have been set at. Provide 2 hours of training for City of New York personnel in accordance with the requirements of Section 01821 - Training.

-END OF SECTION-

**Section 15670**  
**CONDENSING UNITS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Air-cooled condensing units complete with refrigerant compressors, condensing coils, condenser fans, controls, and accessories.

**1.02 RELATED SPECIFICATIONS**

- A. Section 03300 - Cast-in-Place Concrete
- B. Section 15071 - Vibration Control
- C. Section 15184 - Refrigeration Piping and Specialties
- D. Section 15720 - Air Handling Units
- E. Section 15900 - HVAC Controls

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. ASHRAE 15 - Safety Code for Mechanical Refrigeration
  - 2. NEMA MG 1 - Motors and Generators
  - 3. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical
  - 4. UL 303 - Refrigeration and Air-Conditioning Condensing, and Compressor Units
  - 5. UL 465 - Air Conditioners, Central Cooling
  - 6. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment
  - 7. ARI 520 - Positive Displacement Refrigerant Compressors, and Condensing Units
  - 8. ASHRAE 23 - Methods of Testing for Rating Positive Displacement Condensing Units
  - 9. ARI 270 - Sound Rating of Outdoor Unitary Equipment
  - 10. ASHRAE 90.1- Energy Conservation in New Building Design



11. ANSI Z21.47/UL1995 – Unitary Air Conditioning Standard for safety requirements

1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Submit catalog product data indicating dimensions, general assembly, specialties and accessories, weights, rated capacities, performance ratings, materials and finishes, controls, electrical requirements, and wiring diagrams.
- C. Shop Drawings: Submit shop drawings indicating components, assembly, equipment locations, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant compressors, refrigeration piping, and accessories required for complete system.
- D. Operations and Maintenance Manuals: Submit Operations and Maintenance Manuals as specified in Section 01831 including manufacturer's descriptive literature including installation and operation instructions, start-up instructions, controls, accessories, maintenance and repair data, and parts lists.

1.05 QUALITY ASSURANCE

- A. Provide equipment from a company specializing in the design and manufacture of condensing units which has a minimum of three (3) years documented experience, and issues complete catalog data on these products.

1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.
- B. Shipping and Handling: Comply with the manufacturers' instructions for rigging, unloading and transportation of units.
- C. Storage and Protection: Store equipment in its original shipping crates or containers, with labeling in place until time of installation. Store equipment in clean, dry place and protect coils from physical damage.

1.07 SPARE PARTS

- A. Furnish one complete change of lubricating oil.

1.08 WARRANTY

- A. Provide one year parts warranty from the start-up date.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Air Cooled Condensing Units
  - 1. The Trane Company
  - 2. Carrier Corporation
  - 3. York International Corp.

## 2.02 MATERIALS

- A. General: Factory fabricate, assemble, test and finish condensing units with indicated capacities and characteristics, and including all necessary accessories for complete installation.
- B. Air Cooled Condensing Units: Provide air-cooled condensing units of minimum size, capacity and arrangement shown and scheduled, meeting the following requirements.
  - 1. Provide factory assembled, air cooled condensing unit prepiped and prewired, comprising refrigeration compressor equipment, condenser coil, condenser fans and motors, magnetic starters, controls, and fan guards mounted in heavy gauge steel casing. Construct casing of one piece welded assembly with removable panels for access to all components.
  - 2. Protect the entire air-cooled condenser unit including condenser coil with a protective coating.
  - 3. Provide Corrosion Protective Coating for Coils: Provide protective corrosion-resistant coating meeting the following requirements:
    - a. Air-Dried Polyelastomer Coating: Provide a single component, complex chain linked polyelastomer coating (Husky coil coat-dip protective coating as manufactured by Bronz-Glow Industries or approved equal). Thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer (if required) and coating of an air-dried poly elastomeric corrosion-resistant coating to obtain a minimum total dry film thickness of 0.8 – 1.5 mils.
    - b. Manufacturer recommendations: Perform cleaning, surface preparation, and coating procedures as specified and in accordance with the coating manufacturer's published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.

- c. Surface Preparation: Remove all traces of oil, grease, rust, dirt and dust. Pressure rinse with a high pH cleaning solution. Rinse with fresh water. Pressure rinse with a low pH cleaning solution to reduce surface pH to 5.0 to 7.0. Allow to air-dry thoroughly.
4. Provide hermetic type compressor with forced feed lubrication provided by positive displacement reversible oil pump, a crankcase sight glass, and electric crankcase heater. Provide compressor equipped with suction and discharge shutoff valves, and mounted on spring vibration isolators.
5. Provide operating and safety controls for condensing unit including refrigerant high and low pressure safety cutouts, low oil pressure cutout, and compressor winding thermostat cutout. Provide condensing unit complete with circuit breaker and magnetic starter, control circuit fusing and control power transformer. Provide necessary relays, timers and manual reset overloads.
6. Provide condenser coil constructed of seamless copper tubing mechanically bonded to heavy-duty aluminum plate fins with protective coating of Heresite or approved equal. Test condenser coils at factory at 450 psig air pressure under water, and vacuum dehydrate. Seal with holding charge of nitrogen.
7. Fabricate each condensing unit at factory as one unit including all internal piping and with internal wiring to identified terminal strips in unit control panel.
8. Provide statically and dynamically balanced direct-driven condenser fans of propeller type, with all exposed fan and shaft surfaces weatherproofed and arranged to give vertical air discharge with fan guard, and with permanently sealed ball bearings.
9. Provide factory wired controls mounted in a weatherproof accessible location, including fan contactor, low voltage terminal strip and single point power entry. Provide thermal and current sensitive overload devices for compressor motor protection. Provide solid state compressor protection control system to prevent short cycling due to safety devices or power interruptions, controlled by positive acting timer.
10. Provide accessory equipment including filter-drier, liquid line moisture indicating sight glass, refrigeration tubing, and insulation package. Charge system with recommended oil.

## 2.03 SOURCE QUALITY CONTROL

- A. Provide units constructed and rated in accordance with ARI 210/240. Test in accordance with ASHRAE 23.

- B. Provide units with Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE 90.1.
- C. In the event the unit is not UL approved, the manufacturer shall provide a field inspection by a UL representative to verify conformance to UL standards, at manufacturer's expense. If necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. General: Examine condensing units at the time of delivery for damaged or missing components. Do not proceed with installation of units until all items found defective have been corrected.

### 3.02 INSTALLATION

- A. Install all units in accordance with manufacturer's instructions. Make all necessary adjustments to equipment to provide complete and satisfactory operation upon completion of installation.
- B. Connect to electrical service.
- C. Install units on vibration isolators. Refer to Section 15071 - Vibration Control.
- D. Install units on concrete base as indicated in accordance with the requirements of Section 03300 - Cast-In-Place Concrete.
- E. Provide connections to refrigeration piping system and evaporators. Refer to Section 15184 - Refrigeration Piping and Specialties and comply with ANSI/ASHRAE 15.
- F. Supply the initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

### 3.03 FIELD QUALITY CONTROL

- A. Operation and Checkout: Provide initial and cooling season start-up, and winter season shut down during first year of operation, including routine servicing and check out.
- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and

place the equipment in trouble-free operation, and instruct operating personnel in its operation and maintenance as specified in Division 1.

- C. Tests: After installation of the units, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions.

-END OF SECTION-

**Section 15720**  
**AIR HANDLING UNITS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Air handling units are manufactured in a modular form.
- B. In hazardous locations, provide equipment and wiring meeting the requirements for National Electric Code Class I, Group D, Division (1) (2).

**1.02 RELATED SPECIFICATIONS**

- A. Section 15071 - Vibration Control
- B. Section 15540 - Fuel Fired Heaters
- C. Section 15670 - Condensing Units
- D. Section 15761 - Air Coils
- E. Section 15820 - Ductwork Accessories
- F. Section 15900 - HVAC Controls
- G. Section 16055 - Electrical Requirements for Shop Assembled Equipment
- H. Section 16220 - Electric Motors

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. AMCA 99 - Air Movement and Control Association Standards Handbook
  - 2. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
  - 3. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
  - 4. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data
  - 5. AMCA 500 - Test Methods for Louver, Dampers, and Shutters
  - 6. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
  - 7. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings
  - 8. UL 900 - Test Performance of Air Filter Units
  - 9. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils
  - 10. ARI 430 - Standard for Central-Station Air Handling Units

11. NFPA 90A - Installation of Air Conditioning and Ventilation Systems
12. SMACNA - HVAC Duct Construction Standards
13. ANSI Z21.47/UL 1995 - Unitary Air Conditioning Standard for safety requirements

#### 1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit complete catalog product data, including the following:
  1. Dimensions
  2. Assembly
  3. Weights
  4. Specialties and accessories
  5. Rated capacities
  6. Performance ratings
  7. Controls
  8. Certified fan performance curves with system operating conditions indicated, including brake horsepower, static pressure, and static efficiency plotted against air volume for the duty scheduled
  9. Certified fan sound power ratings for both fan outlet and casing radiation at rated capacity
  10. Certified coil performance ratings with system operating conditions indicated
  11. Motor ratings and electrical characteristics plus motor and fan accessories
  12. Electrical requirements for power supply wiring, including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring
  13. Materials gauges and finishes
  14. Filters with performance characteristics assembly and frames
  15. Dampers, including housings, linkages, and operators

- C. Shop Drawings: Submit shop drawings indicating assembly, locations, dimensions, weight loading, required clearances, construction details, and location and size of each field connection.
- D. Field Reports: Submit field quality control test reports.
- E. Operation and Maintenance Manuals: Submit manufacturer's descriptive literature, including operation instructions, lubrication instructions, filter replacement data, motor and drive replacement instructions, wiring diagrams, controls, accessories, maintenance and repair data, and parts listing. Include this data and product data in an operation and maintenance manual as specified in Section 01831.

#### 1.05 QUALITY ASSURANCE

- A. Fan Performance Ratings: Conform to AMCA 210 and provide the AMCA Certified Rating Seal.
- B. Sound Ratings: Conform to AMCA 301, test to AMCA 300.
- C. Fabrication: Conform to AMCA 99 and ARI 430.
- D. Filter Media: Provide UL 900 listed filter, Class I or Class II.
- E. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.
- F. Manufacturers: Provide equipment from a company regularly engaged in the manufacture of air handling units, of the types and capacities required, whose products have been in satisfactory use in similar service for not less than three (3) years, and which issues complete catalog data on these products.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 1 and as follows:
- B. Delivery and Handling: Deliver products to the site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Handle products properly to prevent damage, breaking, denting and scoring. Do not install damaged equipment, replace damaged units with new ones. Comply with the manufacturer's rigging instructions for unloading and transporting equipment to its final location.
- C. Storage and Protection: Store equipment in its original containers with labeling in place until the time of installation.
  - 1. Store in clean dry place, protect from weather, dirt, fumes, construction traffic, debris, and physical damage.



## 1.07 SEQUENCE AND SCHEDULING

- A. Equipment Pads: Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.
- B. Structural Supports: Coordinate the size and location of structural steel support members.

## 1.08 SPARE PARTS

- A. General: Deliver spare parts securely wrapped or boxed, indexed and tagged with complete information for use and reordering.
- B. Furnish the following spare parts.
  - 1. One complete set of filters for each air handling unit
  - 2. One complete set of belts for each air handling unit
  - 3. One gasket for each sectional joint of each air handling unit

## 1.09 WARRANTY

- A. Provide parts warranty one year from start-up.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Air Handling Units
  - 1. The Trane Company
  - 2. Carrier Corporation
  - 3. York International Corp.
- C. Polyelastomer Corrosion Resistant Coating:
  - 1. Bronz-Glow Industries
- D. Panel-Type Air Filters
  - 1. Servodyne Corp. - Series Hi-E-40A
  - 2. Camfil Farr Company - Model 30/30

## E. Filter Gauges

1. Dwyer - Durablock 200
2. Cambridge Filter Corp.

## 2.02 AIR HANDLING UNITS - TYPE 1

- A. General: Factory fabricate, assemble, test and finish air-handling units of the arrangement, minimum size, capacities and characteristics scheduled. Provide units having refrigeration coils and suitable for externally mounted air-cooled condensing units and indirect gas fired heat modules.
- B. Corrosion Protective Coating for Units: Provide protective corrosion resistant coating meeting the following requirements:
1. Air-Dried Polyelastomer Coating: Provide a single component, complex chain linked polyelastomer coating (SPC- clear or tinted as manufactured by Bronz-Glow Industries or approved equal). Thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer (if required) and coating of an air-dried poly elastomeric corrosion-resistant coating to obtain a minimum total dry film thickness of 6 mils.
  2. Manufacturer recommendations: Perform cleaning, surface preparation, and coating procedures as specified and in accordance with the coating manufacturer's published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.
  3. Surface Preparation: Remove all traces of oil, grease, rust, dirt and dust. Pressure rinse with a high pH cleaning solution. Rinse with fresh water. Pressure rinse with a low pH cleaning solution to reduce surface pH to 5.0 to 7.0. Allow to air-dry thoroughly.
- B. Casing: Fabricate the unit casing of insulated double wall heavy-gauge steel, reinforced and braced with steel angle framework, rigidly constructed and braced to prevent vibration, complete with removable panels for access to all internal parts. Make the casing section joints airtight by using a gasketed or caulked assembly.
- C. Blower: Provide the blower of a double width, double inlet, multiblade, centrifugal type, statically and dynamically balanced at the factory, with a rigid steel shaft with grease lubricated fan bearings and lubrication fittings extended to the service side. Provide the belt drive, including a fan sheave, an adjustable motor sheave permitting adjustment of at least 5 percent above rated cfm, V-belts, and a removable belt guard. Provide adjustable motor supports.
- D. Motors: Provide TEFC high energy efficient type motors furnished in accordance with the requirements of Section 16220 - Electric Motors except that in designated hazardous areas provide explosion-proof type.

- E. Electrical Equipment: All electrical equipment and materials furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop Assembled Equipment.
- F. Drives and Guards: Provide belt drives, including machine matched belts of the size and type recommended for the piece of equipment, with a capacity rating not less than 150 percent of motor rating. Provide each belt drive and each direct coupled drive with a substantial removable guard giving adequate clearance and safety protection at all positions of drive adjustment. Provide openings in the guard to permit measurement of driver and driven pulley speeds.
- G. Drain Pans: Provide double sloped condensate drain pan constructed of PVC with external connections on either side of unit. The drain pan shall be removable for cleaning.
- H. Insulation: Comply with NFPA Standard 90A for insulation. Insulate the coil section, fan section and accessory sections of the unit with 1-inch thick, 3-pound density, mat-faced fiberglass. Secure insulation to the casing with waterproof adhesive and permanent mechanical fasteners.
- I. Coils: Provide coils meeting the requirements of Section 15761 - Air Coils and the minimum capacity and maximum air and water resistance values scheduled.
- J. Gas Fired Heat Modules: Provide gas fired units meeting the requirements of Section 15540 - Fuel Fired Heaters
- K. Dampers: Provide low leak type dampers meeting the requirements of Section 15900 - HVAC Controls.
- L. Mixing Box: Provide parallel-blade dampers in a reinforced, galvanized steel cabinet. Provide galvanized steel damper blades mechanically fastened to steel operating rods. Connect operating rods for each set of dampers together with a common linkage and interconnect linkages so that dampers operate simultaneously and in the opposite direction (one opens when the other closes).
- M. Air Filters: Comply with NFPA Standard 90A for air filters. Provide air filters as required and as follows.
  - 1. Provide panel filters of the sizes scheduled, 2-inch thick, pleated media replaceable type, with not less than 30 percent atmospheric dust spot efficiency on the ASHRAE Standard 52 Test.
  - 2. Equip panel filter units with side removal filter racks and sealing devices to accommodate the filters, complete with hinged access doors with cam fasteners to facilitate filter replacement.

- N. Filter Gauges: Provide filter gauges for measuring the pressure drop across each bank of air filters. Provide gauges complete with all necessary tubing, static tips, and accessories, including 3-way cocks arranged for ease in checking liquid level.
- O. Vibration Control: Provide air handling units with the fan and motor assembly internally isolated from unit casing with spring vibration isolators meeting the requirements of Section 15071 - Vibration Control.
- P. Controls: Provide controls in accordance with Section 15900 - HVAC Controls and as follows:
1. Select, provide, and mount damper actuators on each damper. Actuators shall be of sufficient size and quantity to ensure complete damper operation. Actuators shall be direct coupled to minimize linkage.
  2. Provide differential pressure switches. Pressure switches shall be factory installed across each filter bank for individual filters to monitor clean/dirty filter status.
  3. Provide differential pressure gauges. Pressure gauges shall be factory installed across each filter bank for individual filters. The gauge shall be diaphragm- actuated dial type.
  4. Provide a momentary push-button reset circuit using a double-pole low limit switch. Low limits shall be factory engineered to maximize coil coverage. Capillary radius clips shall be used at low limit bends to ensure no crimping or wear of low limits. Low limits shall be wired to shut down the fan to protect the unit.
  5. Provide and mount fan status switches.
  6. Provide and mount discharge temperature sensors on the fans. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
  7. Provide outside air temperature sensors.
  8. Provide averaging temperature sensors. Sensors shall be factory engineered to accurately measure mixed air temperatures. Capillary radius clips shall be used at capillary bends to ensure no crimping or wear of the tube. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
- Q. All heating and ventilating units shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A. Equipment shall be provided with seismic restraints in accordance with City of New York Building Code and referenced Uniform Building Code requirements.

## 2.03 AIR HANDLING UNITS - TYPE 2

- A. General: Factory fabricate, assemble, test and finish air-handling units of the arrangement, minimum size, capacities and characteristics scheduled. Provide units having refrigeration coils and suitable for externally mounted air cooled condensing units and electric heating module.
- B. Corrosion Protective Coating for Units: Provide protective corrosion resistant coating meeting the following requirements:
1. Air-Dried Phenolic Coating: Where an air-dried phenolic corrosion-resistant coating is required, thoroughly clean, prepare and protect against corrosion all metal parts of unit with one coat of primer and at least two coats of an air-dry phenolic corrosion-resistant coating to obtain a minimum total dry film thickness of 4 to 6 mils.
- C. Manufacturer Recommendation: Perform cleaning and coating procedures as specified and in accordance with the coating manufacturers published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.
1. Air-Dried Polyelastomer Coating: Provide a single component, complex chain linked polyelastomer coating (SPC- clear or tinted as manufactured by Bronz-Glow Industries or approved equal). Thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer (if required) and coating of an air-dried poly elastomeric corrosion-resistant coating to obtain a minimum total dry film thickness of 6 mils.
  2. Manufacturer recommendations: Perform cleaning, surface preparation, and coating procedures a specified and in accordance with the coating manufacturer's published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.
  3. Surface Preparation: Remove all traces of oil, grease, rust, dirt and dust. Pressure rinse with a high pH cleaning solution. Rinse with fresh water. Pressure rinse with a low pH cleaning solution to reduce surface pH to 5.0 to 7.0. Allow to air-dry thoroughly.
- D. Casing
1. Fabricate the unit casing of zinc coated heavy-gauge steel, reinforced and braced with steel angle framework, rigidly constructed and braced to prevent vibration, complete with removable panels for access to all internal parts. Make the casing section joints airtight by using a gasketed or caulked assembly.
  2. Casting shall be completely insulated with cleanable, foil faced, fire-retardant, permanent, odorless glass fiber material. All insulation edges shall be either captured or sealed. Knockouts shall be provided for unit electrical

power and refrigerant piping connections. Captive screws shall be standard on all access panels.

- E. Blower: Provide the blower of a double width, double inlet, forward centrifugal type, statically and dynamically balanced at the factory. Provide the belt drive, including a fan sheave, an adjustable motor sheave permitting adjustment of at least 5 percent above rated cfm, V-belts and a removable belt guard. Provide adjustable motor supports. Fan bearings shall be permanently lubricated.
- F. Motors: TEFC high energy efficient type motors furnished in accordance with the requirements of Section 16220 - Electric Motors, except that in designated hazardous areas provide explosion-proof type.
- G. Electrical Equipment: All electrical equipment and materials furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop-Assembled Equipment.
- H. Drives and Guards: Provide belt drives, including machine matched belts of the size and type recommended for the piece of equipment, with a capacity rating not less than 150 percent of motor rating. Provide each belt drive and each direct-coupled drive with a substantial removable guard giving adequate clearance and safety protection at all positions of drive adjustment. Provide openings in the guard to permit measurement of driver and driven pulley speeds.
- I. Drain Pan: Provide drain pan mounted under the coil section with cooling coils and where shown. Provide double-sloped condensate drain pan constructed of PVC with external connections on either side of unit. The drain pan shall be removable for cleaning.
- J. Insulation: Comply with NFPA Standard 90A for insulation. Insulate the coil section, fan section and accessory sections of the unit with 1-inch thick, 3-pound density, mat-faced fiberglass. Secure insulation to the casing with waterproof adhesive and permanent mechanical fasteners.
- K. Coils: Provide coils meeting the requirements of Section 15761 - Air Coils, and the minimum capacity and maximum air resistance values scheduled, except as noted in this section.
- L. Refrigeration System: The units shall have a single refrigeration circuit refrigeration circuit controlled by a factory-installed thermal expansion valve.
- M. Evaporator Coil: Configured aluminum fin surface shall be mechanically bonded to 3/8-inch internally enhanced copper tubing and factory pressure and leak tested at 375 psig. Coil is arranged for draw-through airflow and shall provide a double sloped condensate drain pan constructed of PVC plastic. The drain pan shall be removable for cleaning. Coil shall be completely factory assembled including the expansion valves and drain pans. Unit casing shall be constructed of zinc coated,

heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with an enamel finish. Casing shall be completely insulated with foil faced, fire-retardant, permanent, odorless glass fiber material.

- N. Electric Heaters: UL and CSA approved electric heat modules shall be available for installation directly on fan discharge. Electric heater shall be two stage control, single-point electric power connection and terminal strip connections. Electric heater element shall be constructed of heavy-duty nickel chromium elements internally wye connected on 480/600 volt, three phase. Each 480/600 volt heater shall have automatic line break high limit controls.
- O. Dampers: Provide low leak type dampers meeting the requirements of Section 15900 - HVAC Controls.
- P. Air Filters: Comply with NFPA Standard 90A for air filters. Provide air filters as required and as follows.
  - 1. Provide panel filters of the sizes scheduled, 2-inch thick, pleated media replaceable type, with not less than 30 percent atmospheric dust spot efficiency on the ASHRAE Standard 52 Test.
  - 2. Equip panel filter units with side removal filter racks and sealing devices to accommodate the filters, complete with hinged access doors with cam fasteners to facilitate filter replacement.
- Q. Filter Gauges: Provide filter gauges for measuring the pressure drop across each bank of air filters. Provide gauges complete with all necessary tubing, static tips, and accessories, including 3-way cocks arranged for ease in checking liquid level.
- R. Vibration Control: Provide air handling units with the fan and motor assembly internally isolated from unit casing with spring vibration isolators meeting the requirements of Section 15071 - Vibration Control.
- S. Mounting Subbase: Subbase shall be constructed of heavy gauge, zinc coated galvanized steel with baked enamel finish to match air handler unit. Provide corrosion-resistant coating to match air handling unit.
- T. Controls: Provide controls in accordance with Section 15900 - HVAC Controls and as follows:
  - 1. Select, provide, and mount damper actuators on each damper. Actuators shall be of sufficient size and quantity to ensure complete damper operation. Actuators shall be direct coupled to minimize linkage.
  - 2. Provide differential pressure switches. Pressure switches shall be factory installed across each filter bank for individual filters to monitor clean/dirty filter status.

3. Provide differential pressure gauges. Pressure gauges shall be factory installed across each filter bank for individual filters. The gauge shall be diaphragm- actuated dial type.
  4. Provide a momentary push-button reset circuit using a double-pole low limit switch. Low limits shall be factory engineered to maximize coil coverage. Capillary radius clips shall be used at low limit bends to ensure no crimping or wear of low limits. Low limits shall be wired to shut down the fan to protect the unit.
  5. Provide and mount fan status switches.
  6. Provide and mount discharge temperature sensors on the fans. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
  7. Provide outside air temperature sensors.
  8. Provide averaging temperature sensors. Sensors shall be factory engineered to accurately measure mixed air temperatures. Capillary radius clips shall be used at capillary bends to ensure no crimping or wear of the tube. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
- U. All heating and ventilating units shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A. Equipment shall be provided with seismic restraints in accordance with City of New York Building Code and referenced Uniform Building Code requirements.

## 2.04 SOURCE QUALITY CONTROL

- A. Test: Perform the following factory tests.
1. Sound Power Level Rating: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings for Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating."
  2. Units Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE 51 - Laboratory Methods of Testing Fans for Rating.



**PART 3 EXECUTION****3.01 EXAMINATION**

- A. General: Perform examination of equipment and field condition as follows.
  - 1. Examine units at the time of delivery for damaged or missing components.
  - 2. Examine areas and conditions for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of central-station air handling units.
  - 3. Examine rough-in for refrigerant, condensate drainage piping and electrical to verify actual locations of connections prior to installation.
  - 4. Do not proceed until unsatisfactory conditions have been corrected.
- B. Power Supply: Verify that proper power supply is available.

**3.02 INSTALLATION**

- A. General: Install equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Support: Support air handling units as follows.
  - 1. Support floor-mounted units on concrete equipment pads using housed spring isolators. Secure units to anchor bolts installed in concrete equipment pads.
  - 2. Support suspended units from structural steel support frame using threaded steel rods and vibration isolation springs in accordance with Section 15071 - Vibration Control.
- C. Access Space: Provide access space around air handling units, coils and motors for service. Provide no less than the minimum as recommended by the manufacturer. Allow space for motor, coil, and filter removal.
- D. Ductwork and Piping Connections: Make final connections of ductwork and piping as detailed on approved shop drawings. Install air handling units in conformance with ARI 435. Provide flexible connections at inlet and discharge of air handling equipment and where shown.
- E. Electrical Leads: Install air handling units as shown and specified, with flexible electrical leads.
- F. Air Filters: Install a new set of filters in each system at the time of substantial completion.

- G. Operating Requirements: Do not operate air handling units for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
- H. Filter Gauges: Install air filter gauges for measuring the air flow resistance through filters at all filter sections and filter banks for all air handling units. Install filter gauge static pressure tips upstream and downstream of filters. Mount filter gauges on outside of filter housing or filter plenum, in accessible position. Adjust and level. Permanently mark each gauge to show the normal resistance rating and the recommended resistance at which the air filters should be placed.
- I. Lubrication: Properly lubricate all pieces of equipment, furnished with lubrication fittings, prior to start-up and at recommended intervals up to substantial completion. Attach a linen tag or heavy-duty shipping tag to each piece of equipment showing the date of lubrication and the name and number of lubricant used. Furnish typewritten list, in triplicate, of each item lubricated and the type of lubricant used.

### 3.03 FIELD QUALITY CONTROL

- A. Adjustment and Cleaning: Perform adjusting and cleaning as follows.
  - 1. Align, adjust and balance each belt drive to prevent noise and vibration.
  - 2. Adjust damper linkages for proper damper operation.
  - 3. Start air handling units and check for excessive vibration and correct.
  - 4. Remove all loose materials and obstructions from interior of equipment.
  - 5. Remove debris and waste materials resulting from installation.
  - 6. Clean tar, adhesive, dirt or marks from exterior of units.
- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, and instruct the operating personnel in its operation and maintenance as specified in Division 1.
- C. Tests: After installation of the units, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15730**  
**PACKAGED AIR CONDITIONING UNITS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Packaged rooftop air conditioning units and packaged indoor air conditioning units.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15071 - Vibration Control
- B. Section 15720 - Air Handling Units
- C. Section 15761 - Air Coils
- D. Section 15900 - HVAC Controls
- E. Section 16055 - Electrical Requirements for Shop-Assembled Equipment

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
- 1. ASME Boiler and Pressure Vessel Code Section VIII, Division 1 - Pressure Vessels
  - 2. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
  - 3. ANSI/NFPA 90A -Installation of Air Conditioning and Ventilation Systems
  - 4. ASHRAE 52.1 -Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
  - 5. FS TT-C-490 -Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings
  - 6. ARI 210/240 -Standard for Unitary Air-Conditioning Equipment
  - 7. ASHRAE 15 -Safety Code for Mechanical Refrigeration
  - 8. ISA-S71.04 -Environmental Conditions for Process Measurement and Control System: Airborne Contaminants
  - 9. ANSI Z21.47/ -Unitary Air Conditioning Standard for safety UL1995 requirements

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit the manufacturer's technical product data, including rated capacities of the selected model clearly indicated, weights of units, furnished specialties and accessories, and installation and start-up instructions.
- C. Shop Drawings: Submit the manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- D. Service Connections: Indicate drain, electrical, and refrigeration rough-in connections on shop drawings and product data.
- E. Wiring Diagrams: Submit the manufacturer's electrical requirements for power supply wiring to packaged air conditioning units, and air purifier units. Submit the manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of packaged air conditioning units and controls. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- F. Operation and Maintenance Data: Submit operation and maintenance data and a parts list for each packaged air conditioning unit, control, and accessory; including "trouble-shooting" maintenance guide. Include this data and product data in an operation and maintenance manual as specified in Section 01831.

**1.05 QUALITY ASSURANCE**

- A. Regulatory Requirements: Conform to ANSI/NFPA 90A, Underwriters Laboratories, National Electrical Codes, Local and State Building Codes for the installation of packaged air conditioning units.
- B. Manufacturer: Provide equipment from a company specializing in the manufacture of the products specified in this section with a minimum of three (3) years documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Handling: Handle packaged air conditioning units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged packaged air conditioning units, air purifier units or components. Replace damaged units with new units.

- C. Storage and Protection: Store packaged air conditioning units, and components in a clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Unloading: Comply with the manufacturer's rigging and installation instructions for unloading packaged air conditioning units and moving units to final location for installation.

#### 1.07 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. One complete set of filters for each packaged air conditioning unit  
One complete set of belts for each belt driven piece of equipment

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Products may be submitted for approval.
- B. Packaged Rooftop Air Conditioning Units
  - 1. The Trane Company
  - 2. Reznor
  - 3. Carrier Corporation
- C. Packaged Indoor Air Conditioning Units
  - 1. The Trane Company

#### 2.02 PACKAGED ROOFTOP AIR CONDITIONING UNITS

- A. General: Provide roof-mounted air conditioning units that are factory fabricated and assembled, factory tested and factory finished, and of the arrangement, minimum size, capacities and characteristics as specified and scheduled. Provide units having electric heating and electric refrigeration. Provide each unit comprised of casing and frame, supply fan, controls, filters, electric heating coil, cooling coil, compressor, condenser coil and condenser fan.
- B. Casing: Provide galvanized steel casing with corrosion protective coating, access hinged doors or removable access panels with quick fasteners, locking door handle type with piano hinges. Fabricate the structural members of heavy gauge galvanized steel.

Provide casings with panels for access to controls, compressors, evaporator fan, motor and drives, dampers and air filters. Provide unit frames to include structural channel bases, reinforced as required to be rigid.

- C. Insulation: Provide 1/2 inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.
- D. Supply Fan: Provide forward curved centrifugal type, double width, double inlet, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor. Isolate complete fan assembly.
- E. Evaporator Coil: Provide an evaporator coil of nonferrous construction with seamless copper tubes mechanically bonded to aluminum fins with corrosion protective coating. Factory test the coil for leakproofness at 375 psig air pressure. Clean and dehydrate the refrigerant system and completely charge the system with refrigerant and recommended oil before shipment. Provide the coil with a remote bulb thermal expansion valve for each refrigerant circuit.
- F. Drain Pan: Provide double sloped condensate drain pan constructed of PVC with external connections on either side of unit. The drain pan shall be removable for cleaning.
- G. Electric Heating Coil
  - 1. Provide the electric heating coil with corrosion protective coating of the size and capacity shown, comprising heating elements fabricated of 80 percent nickel and 20 percent chromium wire, insulated by floating ceramic bushings, supported in an aluminized steel frame with stainless steel terminals insulated with phenolic bushings. Provide the units listed by UL, Inc. built to meet the requirements of the NEC and tested dielectrically at 2,000 volts before shipment.
  - 2. Provide the electric heating coil complete with disc type manual and automatic reset thermal cutouts, built-in magnetic contactors, control transformer, built-in circuit breaker and disconnect switch, fan interlock relay, and pilot lights to indicate when the heater is on and when overheating. Factory wired heater elements and controls to terminal strips with internal wiring suitable for 105 degrees C, all contained in a NEMA Type 3R enclosure and furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop-Assembled Equipment.
- H. Air Flow Switch: Provide an airflow switch factory installed on the unit wired into the electric heating coil control circuit so that the heater cannot operate unless there is adequate airflow through the heater. In lieu of the air flow switch, microprocessor control can be provided to prevent operation of compressor(s) or heater(s) when loss of air flow is detected.

- I. Air Filters: Provide the air filter section equipped with one inch panel-type throw away air filters and a filter gauge meeting the requirements specified in Section 15720 - Air Handling Units.
- J. Compressor: Provide refrigeration compressors of the hermetic scroll or reciprocating type, resiliently mounted with positive lubrication, designed for air-cooled condensing, with service shut-off valves and crankcase heater. Provide the refrigeration section operating and safety controls to include low and high pressure cutout, compressor motor overload and winding thermostat cutout, and controls to prevent frequent unit cycling. Provide three overload relays for three-phase motor starts. Provide control panels with NEMA 4X enclosures, combination magnetic starters with control transformer in conformance with Section 16055 - Electrical Requirements for Shop-Assembled Equipment numbered terminal strip and accessories.
  - 1. Provide refrigeration controls that include reset relay circuits to provide manual resetting of the high pressure control and the compressor winding thermostats. Provide each unit with provision at the control panel terminal block for remote start-stop.
  - 2. Provide five-minute timed off circuit to delay compressor start.
  - 3. Provide step capacity control by hot gas bypass or cycling and unloading.
- K. Condenser: Provide condenser coil of nonferrous construction with Heresite corrosion protective coating and seamless copper tubes mechanically bonded to heavy-duty aluminum fins, with liquid refrigerant subcooling capacity. Factory test condenser coils at 200 psig air pressure under water, and vacuum dehydrated at 175 degrees F. Provide weatherproof corrosion coated condenser fans, of the propeller type, directly driven by a weatherproof motor with permanently lubricated bearings. Provide the condensing units suitable for operation at temperatures down to 0 degrees F ambient air. Provide fan guard at each condenser fan discharge.
- L. Dampers: Provide outside and return dampers with damper operator and control package to automatically vary outside air quantity. Provide the outside air damper that fails to closed position.
- M. Gaskets: Provide tight fitting dampers with edge gaskets, maximum leakage 5 percent at 2 inches pressure differential.
- N. Damper Operator: Provide a 24-volt damper operator with gear train sealed in oil with spring return.



- O. Controls: Provide controls as specified in Section 15900 - HVAC Controls and as follows:
1. Select, provide, and mount damper actuators on each damper. Actuators shall be of sufficient size and quantity to ensure complete damper operation. Actuators shall be direct coupled to minimize linkage.
  2. Provide differential pressure switches. Pressure switches shall be factory installed across each filter bank for individual filters to monitor clean/dirty filter status.
  3. Provide differential pressure gauges. Pressure gauges shall be factory installed across each filter bank for individual filters. The gauge shall be diaphragm- actuated dial type.
  4. Provide a momentary push-button reset circuit using a double-pole low limit switch. Low limits shall be factory engineered to maximize coil coverage. Capillary radius clips shall be used at low limit bends to ensure no crimping or wear of low limits. Low limits shall be wired to shut down the fan to protect the unit.
  5. Provide and mount fan status switches.
  6. Provide and mount discharge temperature sensors on the fans. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
  7. Provide outside air temperature sensors.
  8. Provide averaging temperature sensors. Sensors shall be factory engineered to accurately measure mixed air temperatures. Capillary radius clips shall be used at capillary bends to ensure no crimping or wear of the tube. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.
- P. Economizer: Where noted provide dry bulb economizer complete with indoor and outdoor air sensors and controls. Provide factory-mounted economizer complete with fully modulating 0 to 100 percent motor and dampers, barometric relief, minimum position settings, and preset linkage.
- Q. Roof Curb: Provide roof curb designed to mate with the units downflow supply and return and provide support and a watertight installation when installed properly. The roof curb design shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips

- R. All packaged rooftop air conditioning units shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A, in accordance with the City of New York Building Code and Uniform Building Code.

## 2.03 PACKAGED INDOOR AIR CONDITIONING UNITS

- A. General: Provide factory assembled horizontal, single piece, air cooled, indoor, ceiling plenum mounted electric heating and cooling unit factory tested and of a size, capacity, as specified and scheduled. Provide units with ARI - rated cooling capacity. Contained within the unit enclosure shall be all factory wiring, piping, controls, and refrigerant charge (R-410A).
- B. Casing shall be constructed of galvanized steel with corrosion protective coating . Interior shall be insulated with 1/2-inch thick neoprene coated fiberglass. Insulation shall be bonded to interior surfaces. Provide with side access panels and bottom hanging removable doors to facilitate ease of maintenance. Side panels allow access to the control box, refrigeration components, and condenser coil. Control box shall be hinged allowing access to the compressor and pressure switches. Bottom doors shall allow access to and easy removal of the condenser and evaporator motors and blower assemblies. Provide insulated drain pan equipped with two 3/4-inch threaded condensate drain connections below the evaporator coil and one 3/4-inch threaded connection for condenser coil wash down. Drain line shall be insulated. Unit shall have an integral hanging bracket requiring only 4 threaded rods run to the top flange of the unit for hanging, eliminating need for external hanger brackets. Contains junction box for power connection and opening for routing of control wiring.
- C. Fans
1. Evaporator: Blower shall be of the forward-curved, centrifugal, direct-drive type or belt drive as shown on equipment schedule. Motor shall have permanently lubricated bearings.
  2. Condenser: Blower shall be of the forward-curved, centrifugal, direct-driven type or belt drive as shown on equipment schedule. Motor shall have permanently lubricated bearings.
- D. Compressor: Provide hermetic scroll or reciprocating type compressor complete with accessory equipment and refrigerant piping factory prepiped suitable for operation down to 0°F outdoor ambient.
- E. Coils: Evaporator and condenser coils shall be of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes with all joints brazed with corrosion protective coating (Heresite, or approved equal).
- F. Filter Section: Provide filter section that consist of factory-installed throw-away filters, removable from the same side as the access panels without the use of tools.

- G. Controls and Safeties: Control system shall include a high-pressure switch, a low-pressure switch and a compressor lockout feature which upon tripping of any safety device shall prevent compressor from restarting unit reset at the thermostat. Controls shall be as specified in Section 15900 - HVAC Controls.
- H. Operating Characteristics: Unit shall operate using refrigerant R-410A and shall be designed for indoor suspended horizontal mounting and operation.
- I. Electrical Requirements: Unit shall have single point power connection to leads in terminal box with disconnect switch.
- J. Electric Heat Module: Provide encased U.L. listed electric heating coil, with corrosion protective coating, that shall attach directly to the base unit discharge with bottom access. Factory wired heater elements and controls to terminal strips with internal wiring suitable for 105 degrees C, all contained in a NEMA Type 3R enclosure and furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop-Assembled Equipment. Provide an airflow switch factory installed on the unit wired into the electric heating coil control circuit so that the heater cannot operate unless there is adequate airflow through the heater. In lieu of the air flow switch, microprocessor control can be provided to prevent operation of compressor(s) or heater(s) when loss of air flow is detected.
- K. Vibration Isolation Package: Shall provide 4 spring hangers for ceiling mounted unit to damper vibration that may be transmitted to building structure.
- L. All packaged indoor air conditioning units shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A, in accordance with the City of New York Building Code and Uniform Building Code.

#### 2.04 CORROSION PROTECTIVE COATING FOR COILS

- A. Provide protective corrosion resistant coating meeting the following requirements.
- B. Air-Dried Polyelastomer Coating: Provide a single component, complex chain linked polyelastomer coating (Husky coil coat-dip protective coating as manufactured by Bronz-Glow Industries or approved equal). Thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer (if required) and coating of an air-dried poly elastomeric corrosion-resistant coating to obtain a minimum total dry film thickness of 0.8 – 1.5 mils.
- C. Manufacturer recommendations: Perform cleaning, surface preparation, and coating procedures as specified and in accordance with the coating manufacturer's published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.
- D. Surface Preparation: Remove all traces of oil, grease, rust, dirt and dust. Pressure rinse with a high pH cleaning solution. Rinse with fresh water. Pressure rinse with

a low pH cleaning solution to reduce surface pH to 5.0 to 7.0. Allow to air-dry thoroughly.

### PART 3 EXECUTION

#### 3.01 INSPECTION

- A. General: Examine areas and conditions under which packaged air conditioning units are to be installed. Do not proceed with installation work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Field Verification: Verify that the ceiling system is ready to receive Work and opening dimensions are as indicated on shop drawings.
- C. Service Connections: Examine rough-in for refrigeration, and condensate drainage piping, and electrical conduits, to verify the proper locations of connections prior to installation.

#### 3.02 INSTALLATION

- A. General: Install units in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Electrical Wiring: Install electrical devices furnished by the manufacturer but not specified to be factory-mounted. Furnish a copy of the manufacturer's field wiring diagram with equipment. Verify that the electrical wiring installation is in accordance with the manufacturer's submittal and installation requirements furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop Assembled Equipment. Do not proceed with equipment start-up until the wiring installation is acceptable.
- C. Drain Piping: Connect each unit drain to the nearest indirect waste connection. At drain pans provide a trap constructed at least 1-inch deeper than the fan pressure.

#### 3.03 FIELD QUALITY CONTROL

- A. Start-Up: Start up packaged units, in accordance with the manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, and instruct the operating personnel in its operation and maintenance as specified in Section 01831.

- C. Tests: After installation of the packaged air conditioning units, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions.

3.04 OPERATION DEMONSTRATION

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to demonstrate the proper operation and instruct station personnel in the equipment's operation and maintenance, as specified in Division 1.

-END OF SECTION-

**Section 15761  
AIR COILS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Direct expansion cooling coils and electric heating coils for installation in air systems.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15081 - Piping Insulation
- B. Section 15184 - Refrigeration Piping and Specialties
- C. Section 15900 - HVAC Controls
- D. Section 16055 - Electrical Requirements for Shop-Assembled Equipment

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
  - 2. NEC - National Electrical Code.
  - 3. UL 1096 - Electric Central Air Heating Equipment.
  - 4. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Product Data and Information: Submit product data indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- C. Shop Drawings: Submit shop drawings indicating coil and frame configurations, dimensions, materials, rows, connections and rough-in dimensions.
- D. Diagrams: Submit complete wiring and control diagrams.
- E. Quality Control: Submit manufacturer's certificate that coil capacities, pressure drops and selection procedures meet or exceed specified requirements.

**1.05 QUALITY ASSURANCE**

- A. General: Provide equipment from a company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Storage and Protection: Protect coil fins from crushing and bending by leaving them in the shipping cases until installation, and by storing indoors, in a clean, dry place.
- C. Protect coils from entry of dirt and debris with pipe caps or plugs.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Direct Expansion Cooling Coils
  - 1. The Trane Company
  - 2. Carrier Corporation
  - 3. York International Corp.
- C. Electric Heating Coils
  - 1. INDEECO
  - 2. Brasch Mfg. Co. Inc.

### 2.02 COILS - GENERAL

- A. General Design: Factory fabricate and assemble, factory test, and factory finish air coils, with indicated capacities and characteristics, and including all necessary accessories for complete installation.
- B. Corrosion Protective Coating for Coils: Provide protective corrosion resistant coating meeting the following requirements:
  - 1. Air-Dried Polyelastomer Coating: Provide a single component, complex chain linked polyelastomer coating (Husky coil coat-dip protective coating as manufactured by Bronz-Glow Industries or approved equal). Thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer (if required) and coating of an air-dried poly elastomeric corrosion-resistant coating to obtain a minimum total dry film thickness of 0.8 – 1.5 mils.
  - 2. Manufacturer recommendations: Perform cleaning, surface preparation, and coating procedures as specified and in accordance with the coating

manufacturer's published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.

3. Surface Preparation: Remove all traces of oil, grease, rust, dirt and dust. Pressure rinse with a high pH cleaning solution. Rinse with fresh water. Pressure rinse with a low pH cleaning solution to reduce surface pH to 5.0 to 7.0. Allow to air-dry thoroughly.

## 2.03 DIRECT EXPANSION COOLING COILS

- A. General: Provide units meeting the minimum face area and maximum air friction drop as scheduled coated with protective coating, and as follows.
- B. Headers: Construct headers of seamless copper tubes with silver brazed joints.
- C. Liquid Distributors: Provide copper venturi type distributor with seamless copper distributor tubes.
- D. Tubes: Provide tubes of 5/8 inch OD seamless copper arranged in parallel or staggered pattern, expanded into fins, with silver brazed joints.
- E. Fins: Provide aluminum continuous plate type fins with full fin collars or individual helical finned tube type wound under tension. (Solder coat copper fin coils.)
- F. Testing: Provide coils air tested under water at 300 psig for working pressure of 250 psig; clean, dehydrate and seal with dry nitrogen charge.
- G. Accessory: Provide refrigeration accessory equipment as specified in Section 15184 - Refrigeration Piping and Specialties.

## 2.04 ELECTRIC HEATING COILS

- A. General: Provide units listed by UL Inc., meeting the requirements of the National Electrical Code and furnished in accordance with the requirements of Section 16055 - Electrical Requirements for Shop-Assembled Equipment. Provide units meeting the size, capacities and electric characteristics shown, and as follows:
- B. Construction: Provide frame member, control box and cover and other sheet metal parts constructed of heavy gauge, die formed aluminized steel finished with baked enamel. Construct the electric heating elements of 80/20 percent nickel chromium resistance wire.
- C. Design
  1. Provide finned type, heating elements insulated in tubular type aluminum finned tube, flanged frames designed for installation in air handling equipment.



2. Provide exposed heating elements insulated by floating ceramic bushings, slip-in type designed for installation through a rectangular opening in the duct. Provide heating elements wired to stainless steel terminals insulated with phenolic bushings. Balance electrical circuits for the number of stages shown.
- D. Controls: Provide staging contactor for each heating stage activated by a silicone controlled rectifier (SCR) and step controller. Provide built-in controls prewired to identify terminal strips on the control box by a vernier control system. Provide controls meeting the requirement specified in Section 15900 - HVAC Controls.
- E. Thermal Protection: Provide coils complete with automatic reset thermal cutout wired in series with staging contactors, safety contactor wired to disconnect all underground line voltage conductors of each internal circuit, contactor holding coils connected in series with built-in manual reset thermal cutouts for back-up protection, overcurrent protective fuses or circuit breaker to open all underground line voltage conductors of each internal circuit and control voltage transformer in the event of an overcurrent condition, main safety disconnect switch to disconnect power automatically when the control box door is opened, and an airflow switch to prevent heater operation upon airflow failure.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine units at the time of delivery for damaged or missing components. Do not proceed with the installation of units until all items found defective upon examination have been corrected.

#### 3.02 INSTALLATION

- A. General: Install coils in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Make all necessary adjustments to the equipment to provide a complete and satisfactory operation upon completion of the installation.
- B. Removal Space: Install to permit removal of coils. Provide no less space for removal than minimum as recommended by the manufacturer.
- C. Regulatory Requirements: Install electric heating coils in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- D. Supports: Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Arrange supports to avoid piercing drain pans. Provide an airtight seal between coil and duct or casing.

- E. Protection: Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- F. Alignment: Install coils level.
- G. Connection: Make connections to coils with unions and flanges.
- H. Moisture Eliminators: Provide moisture eliminator for cooling coils where the air velocity exceeds 500 ft/min.
- I. Drain Pans: Provide drain pan and drain connections for cooling coils. Fabricate drain pans from 20-gauge galvanized steel. Extend the drain pan 3 inches from face of coil entering air side, (6) inches from face of coil leaving air side and 4 inches from face of eliminators. Pipe drain pans individually to floor drain with water seal trap.
- J. Sight Glass: On refrigerant coils, provide a sight glass in the liquid line within 12 inches of the coil.
- K. Insulation: Insulate headers located outside air flow as specified for piping. Refer to Section 15081 - Piping Insulation.

### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Provide the services of a qualified representative of the manufacturer to inspect the installation of air coils, certify that it meets the manufacturer's recommendations, and instruct the operating personnel in their operation and maintenance.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15765**  
**TERMINAL HEAT TRANSFER UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Baseboard heaters and electric unit heaters.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15071 - Vibration Control
- B. Section 16055 - Electrical Requirements for Shop Assembled Equipment

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. NFPA 70 - National Electrical Code

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Product Data: Submit manufacturer's specifications for terminal heat transfer units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.
- C. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
- D. Wiring Diagrams: Submit the manufacturer's electrical requirements for power supply wiring to terminal units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between those portions of wiring that are factory-installed and portions to be field-installed.
- E. Samples: Submit 3 samples of each type of cabinet finish furnished.
- F. Operation and Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in operation and maintenance manuals as specified in Section 01831 – Operation and Maintenance Manuals.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide equipment from firms regularly engaged in the manufacture of terminal units, of the types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. UL Compliance: Provide electrical components for terminal units which are listed and labeled by UL.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.
- B. Protection Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components, replace them with new units.
- C. Storage: Store terminal units and components in a clean dry place, protected from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Handling: Comply with the Manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.

## 1.07 SEQUENCE AND SCHEDULING

- A. Install terminal heat transfer units after walls and ceilings are finished and painted to avoid damage to the units.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Baseboard Heaters
  - 1. Q-Mark, Marley Electric Heating
  - 2. Trane Company
- C. Electric Unit Heaters
  - 1. Trane Co.
  - 2. Reznor
  - 3. Industrial Engineering and Equipment Co. (INDEECO)

## 2.02 MATERIALS

## A. Baseboard Heaters

1. Type: Wall mounted electric, baseboard heaters, completely factory wired with integral thermostat, end caps and filler or blank sections shall be included.
2. Capacity: As specified on the Contract Drawings.
3. Cabinet
  - a. 16 gage steel enclosure with reinforced all welded construction
  - b. Enclosure chemically treated to resist corrosion.
  - c. Top discharge to be an extruded aluminum bar grille with protective 1/4-inch mesh screen below grille.
  - d. Bottom air inlet perforated openings
  - e. Back surface of heater, filler and blank section enclosure to be completely smooth, except for electrical knockouts and mounting holes.
  - f. Bottom of front cover fastened to back panel with concealed screws and top of front cover to engage with grille supports.
  - g. Sleeve, end cap and corner accessories to be internal telescoping type, mounted to concealed top and bottom sliding set screw fasteners in end of sill line heaters, filler or blank sections and finished in dark baked enamel.
  - h. Back panel slotted along top and bottom for attachment to wall without removal of heating assembly.
  - i. Fill and blank section accessories to be of same cross-section as heater enclosure, with butt-joint end. 8-inch filler section to have hinged access door.
  - j. All heaters and electrical accessories to be labeled by Underwriters Laboratories, Inc.
  - k. Provide baseboard unit heater with corrosion protective coating (Heresite or approved equal).

## 4. Elements

- a. Heating elements shall be aluminum.
- b. Elements shall be center anchored and shall float freely on each end through nylon bushings.

## 5. Controls

- a. Factory installed built-in controls shall include thermostat, power disconnect switch, transformer relay, etc. Wall mounted thermostats for field wiring where shown on the Contract Drawings.
- b. Thermostats shall be adjustable.
- c. An automatic reset thermal overload protector with automatic reset shall run the full-length of the heater and shall turn off heating elements should overheating occur at any point along heating length.

B. Electric Unit Heaters: Provide electric unit heaters of the minimum size, heating and air capacities, electric characteristics and arrangement shown, meeting the following requirements.

1. Provide each unit comprised of a dynamically balanced aluminum blade propeller fan direct-driven by a totally enclosed continuous duty motor, metal sheathed electric heating elements, power magnetic contactors, and automatic reset thermal overload cutout, all mounted in a heavy gauge metal cabinet. Construct the cabinet of phosphate treated steel finished in baked enamel.
2. Provide electrical components factory prewired to a terminal strip. Provide the units noted for three phase electric supply wired to give balanced electrical circuits. Provide an integral transformer to give a low voltage control circuit if the power supply is other than 115 volt single phase.
3. Provide electric unit heaters listed by the Underwriters Laboratories Inc. and meeting the requirements of the National Electric Code.
4. Provide ceiling or wall mounting brackets where required, and a fan guard.
5. Suspend unit heaters by hanger rods and neoprene vibration isolators meeting the requirements specified in Section 15071 - Vibration Control.
6. Provide electric unit heater with corrosion protective coating (Heresite or approved equal).

**PART 3 EXECUTION****3.01 INSPECTION**

- A. General: Examine areas and conditions under which terminal units are to be installed. Verify that the required utilities are available, in the proper location, and ready for use. Do not proceed with Work until unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. General: Install terminal heat transfer units, in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Baseboard Heaters: Locate baseboard heaters where shown on drawings.
- C. Unit Heaters: Hang unit heaters from the building structure, with pipe hangers anchored to the building, not from piping. Mount the units as high as possible to maintain the greatest headroom unless otherwise indicated.
- D. Equipment Protection: Protect units with protective covers during the balance of construction.
- E. Electrical Requirements: Install electric heating equipment including devices furnished by the manufacturer but not factory-mounted. Furnish a copy of the manufacturer's wiring diagram submittal. Verify that the electrical wiring is furnished in accordance with the requirements of Section 16055 – Electrical Requirements for Shop Assembled Equipment.

**3.03 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1.
- B. Tests: After installation of the terminal heat transfer units, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions.

**3.04 CLEANING AND PAINTING**

- A. General: After construction is completed, including painting, clean exposed surfaces of units, vacuum clean terminal coils and the inside of cabinets.



- B. Touch-Up: Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by the manufacturer.

-END OF SECTION-

**Section 15771**  
**ELECTRIC HEAT TRACING SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install electric heat tracing system(s) as indicated on Contract Drawings or specified herein.
  - 1. All piping, valves and accessories related to fluid transfer systems located outdoor and indoor and subject to freezing conditions.
  - 2. HVAC exhaust fan ducts below open exhaust stacks.
  - 3. Other piping where indicated on Contract Drawings or specified.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15081 - Piping Insulation
- B. Section 15076 - Piping and Equipment Identification
- C. Section 15120 - Interior and Exposed Piping Schedules
- D. Section 15815 - Duct Insulation
- E. Division 16 - Electrical

**1.03 REFERENCES**

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. Requirements of this Contract shall supersede the Standards in case of conflict:
  - 1. Factory Mutual (FM)
  - 2. National Electrical Manufacturers' Association (NEMA)
  - 3. Underwriters' Laboratories (UL).
  - 4. The Institute of Electrical and Electronics Engineers (IEEE)
  - 5. NFPA 70 - National Electrical Code.
  - 6. New York City Electrical Code

**1.04 HEAT TRACING SYSTEM DESIGN**

- A. Contract Drawings show approximate number and location of heat trace circuits required.
- B. Design complete heat trace systems based on design criteria contained herein,

## 1.05 SUBMITTALS

- A. Provide all submittals in accordance with the General Conditions and Section 01330 – Shop Drawings.
- B. Samples: Submit for approval the following:
  - 1. One linear foot of each heat trace cable, per type of cable
  - 2. Fastening devices
- C. Shop Drawings: Submit for approval the following:
  - 1. Manufacturers' catalog literature, specifications, and illustrations with the following information:
    - a. Thermal properties
    - b. Physical properties
    - c. Bill of Materials
    - d. Installation instructions
    - e. Jointing recommendations for butt joints and longitudinal seam
    - f. Wiring Schematic
  - 2. Qualifications of the system design engineer
  - 3. System design calculations and equipment layout drawings
  - 4. Details for heating cable installation
  - 5. Data sheet for each electric heating cable with the following information:
    - a. Heater catalog number
    - b. Heater length
    - c. Voltage required
    - d. Ampere load
    - e. Total output in watts
    - f. Output in watts per linear foot
    - g. Thermostats, junction boxes
    - h. Control Panel layout and wiring diagram
- D. Submit record drawings and documents upon completion of the work. Accurately record actual locations of heating cables, resistance temperature detectors and circuit connections.
- E. Submit operation and maintenance manuals in accordance with the procedures and requirements set forth in Section 01831- Operation and Maintenance Manuals.

## 1.06 QUALITY ASSURANCE

- A. The Heat Trace System shall be designed, installed and tested in compliance with IEEE-515.
- B. Manufacturer Qualifications
  - 1. The Contractor shall engage a single firm for performance and other requirements and components of the specified equipment.
  - 2. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed.
  - 3. Manufacturer shall have at least three (3) years experience in production of heat tracing systems.
  - 4. ISO 9001 certified
- C. Installer's Qualifications
  - 1. Installer of heat-tracing equipment shall have at least three (3) years experience in the installation of specified Work, and shall employ only tradesmen with specific skills and experience in this type of Work and show evidence of satisfactory operation in the installations.
- D. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.
  - 1. Underwriters Laboratories, Incorporated
  - 2. National Fire Protection Association (NFPA)
  - 3. Local and National Electrical Code
  - 4. Local and State Building Codes and Ordinances
    - a. New York City Construction Codes
    - b. New York State Uniform Fire Prevention and Building Code
    - c. New York State Energy Conservation Construction Code
  - 5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Protection: Material shall be warehoused on or near the job site and drawn from this protected area as used.

## PART 2 PRODUCTS

## 2.01 ELECTRIC HEAT TRACING SYSTEM

- A. General: For each heat tracing system, 480Y/277-volt service power shall be supplied under Division 16 of the Specifications.
  - 1. Each system shall be controlled from a Control/Monitoring panel as defined on the Contract Drawings or in the Specifications.
  - 2. Heat tracing cables shall be installed before insulation is installed.
  - 3. Control Panel/Multiple Heat Trace Circuiting: For each system, power shall be supplied from the Electrical distribution system to the Control/Monitoring panel. Provide overcurrent and GFCI protection for each individual circuit. Locate O/C and GFCI within the Control/Monitoring panel. For each system, provide all conduit and wiring from the Control/Monitoring panel to heat trace cables and field devices.
  - 4. Refer to the Contract Drawings and Specifications for the type of heat tracing application required. Furnish and install a complete heat tracing system with all components including temperature sensor, cable, junction box, etc., being the product of one manufacturer or supplier.
  - 5. All outdoor remote connections and equipment shall be corrosion resistant weatherproof, NEMA 4X.
- B. The heater cable shall be suitable for cutting to desired length to suit conditions at installation. The cable shall form a continuous heating circuit. Heat trace cable shall not be used as jumper conduit from one piping system to another. Contractor shall use heat trace cable, wire, conduit and junction boxes to achieve the complete circuit.
- C. The design and materials selected for the electrical heat tracing system shall be in accordance with applicable provisions of the NYCBC, shall meet requirements of Underwriters' Laboratories, IEEE-515 and all other applicable standards.

## 2.02 SELF-REGULATING CABLE

- A. The heater cable shall be capable of maintaining maximum recommended pipe temperatures, and withstand continuous exposure temperatures as outlined below, without permanent damage to the matrix core.
1. The maximum maintenance temperature rating of the cable shall be 150°F.
  2. The maximum continuous exposure rating of the cable shall be 185°F.
  3. The minimum installation temperature rating of the cable shall be -30°F.
  4. At a minimum the heat trace cable shall be designed to maintain the solution in the pipe at a temperature at 40°F, unless otherwise specified, when the ambient temperature is 0°F with a 20 mph wind with a 10 percent safety factor but shall not have a rating of less than 3 watts per foot length of cable.
- B. The heater cable assembly shall consist of two parallel copper bus wires, minimum size 16 AWG, connected through a semi-conductive heating matrix. This heating element shall be covered with a cross-linked polyolefin insulation jacket. This insulation shall be covered by a tinned copper braid and then covered again with a fluoropolymer insulating jacket. The cable heat output capacity and voltage shall be as listed in Article 3.03.
- C. Before shipment, cable shall indicate an insulation resistance of 20 megohms minimum bus to braid using a 2500 volt DC megger and withstand for one minute a voltage equal to twice rated plus 1,000 volts applied bus to braid.
- D. Electric heat trace cable shall be as manufactured by one of the following:
1. Delta-Therm Corporation, Series IN-CBF
  2. Thermon Manufacturing Company, Series BSX-FOJ
  3. Raychem Corporation (Tyco Thermal Controls), Series BTV-CT
  4. Chromalox Inc. Series SRL3
  5. Or approved equal

## 2.03 SELF-REGULATING CABLE – HIGH TEMPERATURE

- A. The heater cable shall be capable of maintaining maximum recommended pipe temperatures, and withstand continuous exposure temperatures as outlined below, without permanent damage to the matrix core.
1. The maximum continuous temperature rating of the cable with the power on shall be 250°F.
  2. The maximum continuous temperature rating of the cable with the power off shall be 375°F.

3. The minimum installation temperature rating of the cable shall be -30°F.
  4. The heat trace cable shall be designed to maintain the solution in the pipe at a temperature at 40°F when the ambient temperature is 0°F with a 20 mph wind with a 10 percent safety factor but shall not have a rating of less than 5 watts per foot length of cable.
- B. The heater cable assembly shall consist of two parallel copper bus wires, minimum size 16 AWG, connected through a semi-conductive heating matrix. This heating element shall be covered with a fluoropolymer insulation jacket. This insulation shall be covered by a tinned copper braid and then covered again with a fluoropolymer insulating jacket. The cable heat output capacity and voltage shall be as listed in Article 3.03.
- C. Before shipment, cable shall indicate an insulation resistance of 20 megohms minimum bus to braid using a 2500 volt DC megger and withstand for one minute a voltage equal to twice rated plus 1,000 volts applied bus to braid.
- D. Electric heat trace cable shall be as manufactured by one of the following:
1. Thermon Manufacturing Company, Series VSX-FOJ
  2. Raychem Corporation (Tyco Thermal Controls), Series XTV-CT
  3. Delta-Therm Corporation, Series HT CB/F
  4. Chromalox, Inc. Series SRM/E20
  5. Or approved equal

## 2.04 HEAT TRACE CONTROLS

### A. Heat Trace Control/Monitoring Panel

1. The temperature controller shall be a microprocessor based temperature control and monitoring system specifically for heat tracing. The single or multiple circuit module, as required, shall provide on-off control, digital information display and alarms. Diagnostic self-test capabilities. Minimum and maximum values monitored during a given period shall be retained for display on demand, independent of temperature alarm set points.
  - a. Real time data for:
    - (1) Temperature
    - (2) Heater current
    - (3) Ground leakage current
  - b. Stored data for:
    - (1) Highest temperature encountered
    - (2) Lowest temperature encountered

## c. Alarm information for:

- (1) Low and high temperature
- (2) Low and high heater current
- (3) Ground leakage current
- (4) Damaged RTD sensor

## 2. Specifications

- a. Single heat trace circuit up to 30 amps
  - b. 120 or 208/240 Vac module supply voltage
  - c. 120-480 Vac controlled output voltage
  - d. -40° to 140°F ambient operating limits
  - e. Nonvolatile EEPROM data retention
  - f. 30 to 150 mA ground leakage alarm/trip
  - g. Modbus ASCII via RS 485 communications port
  - h. On-Off control with soft start to limit in-rush current
  - i. Branch circuit protected by GFCI circuit breakers
3. The heat tracing systems installer shall review and coordinate power (voltage and phase) provided to determine input module supply voltage.
  4. The panel shall utilize a backlit display for reporting temperatures and operating parameters. Separate LED's indication of status of power to the control panel, power to the heat tracing circuit and any alarms affecting the system. All alarms shall activate a solid state alarm relay rated at 1 ampere at 240 Vac and shall be wired to an audio device.
  5. Control module and all wiring and control accessories shall be enclosed in a NEMA 4X fiberglass reinforced plastic enclosure with clear vision panel to view control module data display. Enclosure panel shall accommodate multiple heat trace modules as required. Panel shall provide for rack mounting of multi-circuit control modules.
    - a. Enclosure shall include a suitably sized panelboard for power distribution to the multiple heat trace circuits, including spare circuits as required by the Specifications. Enclosure shall include a main power fused disconnect, sized to accommodate future circuits.
    - b. Control module(s) and power distribution equipment may be housed in separate enclosure panels. Wiring and conduit between panels shall be provided by the Contractor.
  6. Provide all power wiring, control wiring, conduit, and electrical accessories between the Heat Trace Control/Monitoring Panels, thermostats, sensors, heat trace cable and all other remote field installed devices as required and in accordance with Division 16.



7. Provide dry contact closure for remote monitoring of the following:
  - a. System Fault (comprised of the following):
    - (1) Low and high temperature
    - (2) Low and high heater current
    - (3) Ground leakage current
    - (4) Damaged RTD sensor
  - b. Provide Wire and conduit from the Control/Monitoring Panels to the PLC.
8. Acceptable Control/Monitoring Panel manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - a. Delta-Therm Corporation
  - b. Thermon Manufacturing Company
  - c. Raychem Corporation (Tyco Thermal Controls)
  - d. Chromalox, Inc.
  - e. Or approved equal

B. Resistance Temperature Detector (RTD)

1. RTD shall be three-wire platinum, right-angle construction, with an integral junction box.
  - a. RTD housing shall be 316 stainless steel
  - b. Junction box shall be NEMA 4 cast aluminum
  - c. RTD shall be Thermon Manufacturing Company, Series RTD-100, or approved equal
2. Install RTD's at locations and in quantities as shown in detailed design provided by heat trace system supplier.

C. Moisture Sensor

1. Moisture sensor with integral ambient thermostat to detect snow.
  - a. Moisture sensor enclosure shall be NEMA 4, suitable for direct conduit mounting.
  - b. Moisture sensor shall be Environmental Technology, Inc., Series CIT-1, or approved equal.

2. Install moisture sensor(s) at locations and in quantities as shown in detailed design provided by heat trace system supplier.

## 2.05 ACCESSORIES

- A. Insulation and Metal Jacket: Refer to Section 15081 - Piping Insulation and Section 15815 - Duct Insulation.
- B. Aluminum Tape
  1. Aluminum tape shall be 2-mil thick, high tensile aluminum foil coated with fire retardant, acrylic pressure-sensitive adhesive.
  2. Two-inch wide aluminum foil-coated tape, provided by the heat trace manufacturer, shall be installed on top of, and parallel to, the heat trace cable to increase the area of heat transfer.
  3. Provide one of the following:
    - a. Delta-Therm Corporation, Catalog No. T-AL200
    - b. Thermon Manufacturing Company, Catalog No. AL-20P
    - c. Raychem Corporation, Catalog No. AT-180
    - d. or approved equal
- C. Splicing connectors, end termination, caution labels, tee connectors and power termination kits shall be provided as required to achieve a complete heat trace system in accordance with Division 16. Control wiring and conduit shall all be in accordance with Division 16.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Ensure that surfaces of all equipment including pipes, valves, fittings and ducts are clean and dry before installing heat tracing.
- B. Ensure that piping and equipment has been inspected and released for application of insulation.
- C. Beginning of installation indicates that installer accepts conditions.

### 3.02 ELECTRIC HEAT TRACE CABLE INSTALLATION

- A. Cable shall be carefully located so as to preclude subsequent damage coincident with normal operations and maintenance.

- B. Cable installation should begin at the cold junction and work toward the hot junction allowing extra cable as required.
- C. Allow additional cable for valves, flanges and supports per manufacturer's instructions.
- D. Initial cable lay should be done with temporary taping or banding to permit final placement so as to uniformly position the cable on the pipeline.
- E. Band cable to pipe with fiberglass tape wraps approximately every 12 inches. Locate cable on pipe per manufacturer's instructions.
- F. Accordion cable around valves, etc. to avoid overlaying cable over cable.
- G. Special care is required to permit turning, or inserting, spec blinds, repacking or replacing valves, and adjusting and calibrating process control instruments.
- H. Provide insulation and metal jacket for heat-traced systems as specified in Section 15081 - Piping Insulation and Section 15815 - Duct Insulation. Do not install insulation and jacketing until the testing requirements of Article 3.05 are satisfied. The installed heating cable should be covered with thermal insulation and waterproof jacketing as rapidly as possible. Install thermal insulation in accordance with insulation requirements specified herein.
- I. The following decal type sign shall be prominently fixed to the exterior of the thermal insulation every 10 feet and readily visible from ground level: ELECTRIC HEAT TRACING: CAUTION. The sign shall indicate the panel number and circuit number of the particular heat trace circuit at the location of the sign.

### 3.03 SCHEDULE

- A. Circuit voltage and heat output (watts per foot) for heat trace cable shall be as specified below.

	Circuit Voltage	Watts/Foot*
Interior and exterior pipes up to and including 4" diameter	277	3
Interior and exterior pipes larger than 4" diameter	277	5
HVAC Exhaust Ducts	277	20

\* Nominal Watts/Foot at 50°F and 240V.

3.04 CLEANING

- A. Clean tar, cement or other dirt from the heat trace cable.
- B. Remove debris and other waste material resulting from installation.
- C. Do not disturb pipe coating.

3.05 TESTING

- A. Perform insulation resistance test of each bus wire to the copper braid at the following stages. The minimum acceptable reading will be 20 megohms.
  - 1. After receipt of heat trace cable and prior to installation.
  - 2. After installation and splicing (if required) of the heat trace cable, but prior to installation of insulation and jacket.
  - 3. After installation of insulation and jacket.
- B. If at any time the insulation resistance test shows an unacceptable reading, correct any deficiencies according to manufacturer's guidelines and repeat testing.
- C. After making power connections, test the continuity of each heat trace circuit (both legs) from end to end.
- D. Thoroughly test the Heat Trace Control/Monitoring panel and monitoring system to establish proper operation and benchmarks from which to evaluate system degradation.
- E. Record all test results and include test report in the Operation and Maintenance Manuals.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 15810  
DUCTWORK****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Ductwork materials, construction, hangers and supports, duct lining and cleaning.

**1.02 RELATED SPECIFICATIONS**

- A. Section 07921 - Interior Sealants
- B. Section 10200 - Louvers and Screens
- C. Section 15076 - Piping and Equipment Identification
- D. Section 15815 - Duct Insulation
- E. Section 15820 - Ductwork Accessories

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:

- 1. ASHRAE - ASHRAE Handbook - Fundamentals; Duct Design
- 2. ASHRAE - ASHRAE Handbook - HVAC Systems and Equipment; Duct Construction
- 3. ASTM A 36/A36M- Specification for Structural Work
- 4. ASTM A 240 - Heat-Resisting chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
- 5. ASTM A 480 - General Requirements for Flat Rolled Stainless Heat-Resisting Steel Plate and Strip
- 6. ASTM A 700 - Practices for Packaging, Marking and Loading Methods for Steel Products for Domestic Shipment
- 7. ASTM C 411 - Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- 8. ASTM C 916 - Specification for Adhesives for Duct Thermal Insulation
- 9. ASTM C 920 - Specification for Elastomeric Joint Sealants
- 10. ASTM C 1071 - Specification for Thermal and Acoustical Insulation

- 11. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
- 12. AWS D1.1 - Structural Welding Code - Steel
- 13. AWS D9.1 - Sheet Metal Welding Code
- 14. BOCA Section M-309- Hazardous Exhaust Systems
- 15. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
- 16. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
- 17. SMACNA - HVAC Duct Construction Standards
- 18. SMACNA - Round Industrial Duct Construction Standards
- 19. SMACNA - Fire Damper Guide
- 20. UL 181 - Factory Made Air Ducts and Air Connectors

#### 1.04 DEFINITIONS

- A. Sealing Requirements Definitions: The following definitions apply for duct system sealing requirements:

- 1. Seams: Joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the duct perimeter are deemed to be joints.
- 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

#### 1.05 SYSTEM DESCRIPTION

- A. Design Requirements: The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

## 1.06 SUBMITTALS

- A. General: Provide all submittals, including the following as specified in Division 1.
- B. Shop Drawings: Submit shop drawings indicating duct systems routing, sizes, fitting details, reinforcing, support, required clearances, and installed accessories and devices.

## 1.07 QUALITY ASSURANCE

- A. General: Provide materials from a company specializing in the design and manufacture of ductwork and duct fittings having a minimum of three (3) years documented experience, which issues complete catalog data on these products.
- B. All supply, return and exhaust ductwork and fittings shall be manufactured by the same company.
- C. Codes: Qualify welding processes and welding operators in accordance with AWS D1.1 for hangers and supports and AWS D9.1. Certify that each welder qualification is current.

## 1.08 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Delivery: Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- C. Storage and Protection: Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes. Store ductwork and duct fittings in a clean dry place and protect from physical damage.

## PART 2 PRODUCTS

## 2.01 DUCTWORK

- A. General: Provide ductwork and plenums conforming to the more stringent recommendations of the current editions of the ASHRAE Handbook and of the SMACNA "HVAC Duct Construction Standards", "Round Industrial Duct Construction Standards" and "Accepted Industry Practice for Industrial Duct Construction".
- B. All ductwork shall be constructed of Type 316L stainless steel



- C. Construction Material: Provide duct reinforcing and duct specialties constructed of the same materials as the duct. Provide 316 stainless steel grilles, registers, and diffusers on duct systems as specified with Type 316L stainless steel fasteners.
- D. Reinforcing: Reinforce ductwork to prevent sagging, flexing and drumming, and build ductwork to be airtight at the fan static pressures scheduled.
- E. Dimensions: The dimensions of the ducts shown are not to be considered absolute; however, any changes from dimensions indicated are subject to approval. Where it is necessary to change dimensions of ducts, do not exceed equivalent friction loss.
  - 1. Duct sizes noted are the clear dimensions inside the duct liner for lined ducts, or the actual inside dimensions for unlined ducts.
- F. Fire Stopping: Furnish in accordance with the requirements of the Specification Section 07921 - Interior Sealants.
- G. Hangers and Supports: Provide duct hangers and supports meeting the following requirements:
  - 1. Building Attachments: Fasten duct hangers and supports to concrete surfaces with Type 316 stainless steel threaded expansion type concrete anchors when cast-in-place concrete inserts are not installed. Do not cut reinforcing steel. Do not use powder actuated concrete fasteners.
  - 2. Hangers: Securely support horizontal ducts from the building structure by means of hanger rods or angle supports as recommended in the current editions of the ASHRAE Handbook and of the SMACNA "HVAC Duct Construction Standards", "Round Industrial Duct Construction Standards" and "Accepted Industry Practice for Industrial Duct Construction. Provide the hanger rods sized for the weight carried, threaded at both ends, and equipped with nuts and washers. Fabricate entire assembly from Type 316 stainless steel. Provide angles as duct bottom supports. When angle hangers are used, extend the hangers from flanged duct connections, extended stiffeners, or fabricated trapezes.
  - 3. Duct Attachments: Provide sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
  - 4. Trapeze and Riser Supports: Provide steel shape conforming to ASTM A 36/A36M as follows:
    - a. Where spiral Type 316L stainless steel ducts are installed, provide Type 316L shapes and plates.

- H. Pressure Loss: Provide duct curves, bends, offsets, transitions and transformation pieces to be gradual, to minimize air turbulence. In general, design duct transformations changing air velocity for minimum loss in total pressure.
  - 1. Refer to equipment schedules for duct system pressure and seal classifications.
- I. Seismic Requirements: All piping and ductwork shall be provided with seismic restraints in accordance with the seismic Restraint Manual, guidelines for Mechanical Systems, latest edition, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) and designed in accordance with the seismic provisions of the international Building Code (IBC) 2003, Section 1621 and ASCE7-02, Section 9.6, in conjunction with the current New York City Building Code to the extent that the most stringent provisions are utilized in developing the design seismic forces. Refer to the General Structural Notes on the Structural Contract Drawings for site and structure specific seismic design criteria.

## 2.02 ROUND SPIRAL DUCTWORK

- A. General: All round spiral supply, return and exhaust ductwork shall be Type 316L stainless steel. The duct system shall consist of fittings that are factory fitted with a sealing gasket and spiral duct which, when installed according to the manufacturer's instructions, will seal the duct joints without the use of duct sealer.
- B. Materials: When specified on contract documents, stainless steel Type 316L in accordance with ASTM A-240 shall be provided.
- C. Construction: Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (-6 inch W.G.) as shown in the latest edition of the Round Industrial Duct Standards, Chapter 11, Tables 11-5.1 minimum required gage based on bending loads and Table 11-5.1 minimum required gage for Class 5 Stainless Steel Spiral Pipe.
- D. Fittings
  - 1. All fittings ends shall come factory equipped with a double lipped, U-profile, EPDM rubber gasket. Gasket shall be manufactured to gauge and flexibility so as to insure that system will meet all the performance criteria set forth in the manufacturer's literature. Gasket shall be classified by an internationally recognized laboratory authority to conform to ASTM E84-91a and NFPA 90A flame spread and smoke developed ratings of 25/50
  - 2. All fitting ends shall be calibrated to manufacturer's published dimensional tolerance standard and associated spiral duct.

3. All elbows from 3" to 12" diameter shall be 2 piece die stamped and continuously stitch welded. All elbows 14" diameter and larger shall be standing seam gorelock construction and internally sealed.
4. The radius of all 90° and 45° elbows shall be 1.5 times the elbow diameter, unless otherwise noted on the Contract Documents to be 1.0 times the elbow diameter. The radius of all 15°, 30° and 60° elbows shall be 1.0 times the elbow diameter.
5. All fittings that are of either spot-welded or button punched construction shall be internally sealed. When contract documents require divided flow fittings, only full body fittings will be accepted. The use of duct taps is unacceptable except for retrofit installations.
6. All volume dampers shall be fitting sized to slip into spiral duct. Damper shall have the following features:
  - a. Locking quadrant with blade position indicator
  - b. 2" sheet metal insulation stand-off
  - c. Integral shaft/blade assembly
  - d. Shaft mounted, load bearing bushings
  - e. Gasketed shaft penetrations to minimize leakage

E. Spiral Duct

1. Spiral duct shall be calibrated to manufacturer's published dimensional tolerance standard.
2. All spiral duct 14" Dia. and larger shall be corrugated for added strength and rigidity.
3. Spiral seam slippage shall be prevented by means of a flat seam and a mechanically formed indentation evenly spaced along the spiral seam.

- F. Performance: Duct system performance shall meet requirements at the system design static pressure as indicated on the Contract Drawings.

2.03 STAINLESS STEEL DUCTWORK

- A. All ductwork shall be constructed of Type 316 stainless steel except where specified or indicated on the Contract Drawings.
- B. All stainless steel ductwork shall be shop fabricated in sections with welded flanged ends. No field welding of ductwork will be permitted. Welding equipment and electrodes shall be of a type specifically suited for welding light gauge Type 316 stainless steel.

- C. Flanged duct joints shall be 0.25-inch Butyl gasketed and bolted together with type 316 stainless steel bolts, nuts, washers and lock washers. All duct joints shall be airtight.
- D. All accessories including but not limited to registers, grilles, diffusers, turning vanes, air turning devices, manual volume dampers, motor operated control dampers, fire dampers, and access doors installed in stainless steel ductwork shall be fabricated of the same stainless steel material as the associated ductwork. Supports, angles, clamps and hardware shall be Type 316 stainless steel.
- E. Curbs to prevent water leakage shall be provided around all floor openings. Where concrete curbs are not indicated on the Contract Drawings, provide curbs fabricated of 4-inch by 4-inch by 1/4-inch thick angles with welded corners. The curb shall be set in a mastic compound and securely fastened to the floor to provide a watertight installation. Curbs associated with stainless steel ductwork shall be fabricated by Type 316 stainless steel.

## 2.04 IDENTIFICATION

- A. General: Identification for ductwork systems to be furnished in accordance with the requirements of Section 15076 - Piping and Equipment Identification.

## PART 3 EXECUTION

### 3.01 APPLICATION

- A. General: Except as otherwise indicated construct all ductwork as specified of Type 316L stainless steel in accordance with SMACNA standards.
  - 1. Provide spiral Type 316L stainless steel for all the systems serving all process Areas such as Tipping, Loading, Lidding, Gallery and Maintenance Equipment Storage Area.
- B. Duct Lining: Provide duct lining at the following locations:
  - 1. Ductwork and plenums conveying outside air, extending from intake louvers through to the inlet side of all air-handling units.
  - 2. Air Conditioning Systems
    - a. Supply air ducts from the discharge side of the air handling unit for 20 feet 0 inches downstream, including at least one bend.
    - b. Return air ducts from the inlet side of the air handling unit for 20 feet 0 inches upstream, including at least one bend.

- c. Return air ducts and exhaust air ducts from the inlet side of the return air fan or exhaust air fan 20 feet 0 inches upstream, including at least one bend.
  - d. Supply ducts from air terminal units shall be lined for a distance of 5 feet.
- 3. In toilet exhaust duct branches from each register to a point at least 10 feet downstream and including at least one bend.
  - 4. At other locations shown or noted.

### 3.02 DUCT INSTALLATION, GENERAL

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification as required.
- B. Joints: Install ducts with the fewest possible joints.
- C. Fittings: Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- D. Duct Openings: Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Duct Location: Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- F. Construction Penetrations: Determine the exact location and size of floor opening required for ductwork. Core drill all penetrations through existing floors, walls or ceilings. Chipping is not allowed in lieu of core drilling. Obtain written approval prior to making any new penetrations through existing floors, walls or ceilings. Drill pilot holes before core drilling to locate any interference with existing conduits, equipment, etc. Neatly patch and seal opening after installation of new equipment to match existing walls, floors, ceilings, etc.
- G. Clearances: Where insulated or uninsulated ducts pass through walls, floors, or partitions, provide the opening in the construction not exceeding 1-inch clearance on all sides. Where ducts pass through walls, floors, or partitions required to have a fire-resistance rating and fire dampers are not required, provide the opening in the construction not exceeding 1-inch clearance on all sides, filled solidly with an

approved material capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subject to the same NFPA 251 time-temperature fire conditions required for fire barrier penetration. Where fire dampers are installed, maintain proper clearance for expansions.

- H. Flexible Connections: Support at free end within 12 inches of flexible connection all ducts at flexible connections with air-handling equipment and fans.
- I. Shafts and Enclosures: Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- J. Layout: Coordinate layout with suspended ceiling and lighting layouts and similar finished Work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through electrical equipment spaces and enclosures.
- L. Nonfire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal the space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap openings on four sides by at least 1-1/2 inches.
- M. Seal: Seal externally insulated ducts prior to insulation installation.
- N. Concrete Insert: Install concrete inserts prior to pouring concrete.
- O. Plenum Access Doors: Set plenum access doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- P. Blank Off Panels: Blank off unused portions of louvers with insulated panels provided in accordance with the requirements of Section 10200 - Louvers and Screens.
- Q. Flexible Duct: Provide flexible duct connectors where shown.
- R. Temporary Closures: During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- S. Hanging and Supporting: Support ductwork as follows:
  - 1. Make provisions for supporting all ductwork, dampers and other ductwork accessories, where necessary.

2. Construct, reinforce, support and brace ductwork to prevent buckling, warping, sagging, flexing and vibrating and be quiet in operation under all operating conditions and airtight at the fan static pressures scheduled.
3. Securely support horizontal ducts from the building structure by means of hanger rods or angle supports as recommended in the current editions of the ASHRAE Handbook and of the SMACNA "HVAC Duct Construction Standards", "Round Industrial Duct Construction Standards" and "Accepted Industry Practice for Industrial Duct Construction". Size hanger rods for the weight carried, thread at both ends, and equip with nuts and washers.
4. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
5. Support vertical ducts as recommended in the current editions of the ASHRAE Handbook and of the SMACNA "HVAC Duct Construction Standards", "Round Industrial Duct Construction Standards" and "Accepted Industry Practice for Industrial Duct Construction".

### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide inspect the completed installation, make any necessary adjustments, as specified in Division 1.

### 3.04 CLEANING

- A. General: Perform cleaning Work in accordance with the following:
  1. Keep each duct system internally clean by installing only clean materials and by providing temporary closures during the installation.
  2. Remove all loose materials and obstructions from interior of ducts.
  3. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
  4. Clean large duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

-END OF SECTION-

**Section 15815**  
**DUCT INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all duct insulation complete with auxiliary equipment and accessories as shown, specified and/or required for proper operation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 15810 - Ductwork

**1.03 REFERENCES**

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. The provisions of this Contract shall superseded the Standards in case of conflict:

1. ASTM C 195- Mineral Fiber Thermal Insulation Cement
2. ASTM C 449- Mineral Fiber Hydraulic-Setting Thermal Insulating and Finish Cement
3. ASTM C 553 - Mineral Fiber Blanket and Felt Insulation
4. ASTM C 612 - Mineral Fiber Block and Board Thermal Insulation
5. ASTM C 916 - Adhesives for Duct Thermal Insulation
6. ASTM C 920 - Elastomeric Joint Sealants
7. ASTM C 92 - Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
8. ASTM E 84 - Surface Burning Characteristics of Building Materials
9. ASTM E 119 - Standard Method of Fire Test of Building Construction and Materials: 2 Hour External Total Engulfment Test
10. ASTM E 814 - Standard Method of Fire Tests of Through-Penetration Fire Stops
11. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)



12. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
  13. NFPA 255 - Surface Burning Characteristics of Building Materials
  14. UL 723 - Surface Burning Characteristics of Building Materials
  15. UL 1479 - Through-Penetration Firestop Test
- B. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

#### 1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit the manufacturer's technical product data, insulation materials, fire ratings, material safety data sheets and installation instructions for each type of mechanical insulation. Submit a schedule showing the manufacturer's product number, k-value, thickness, density and furnished accessories for each mechanical system requiring insulation.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide insulation from firms regularly engaged in manufacture of ductwork insulation products, of the types and sizes required, whose products have been in satisfactory use in similar services for not less than three (3) years.
- B. Installer's Qualifications: Use firm with at least three (3) years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation, jackets, coverings, sealers, mastics and adhesives with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 method.
1. Exception - Outdoor Insulation: Flame spread index of 75 and a smoke developed index of 150.
- D. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.
1. Underwriters Laboratories, Incorporated.
  2. National Fire Protection Association.
  3. Local and State Building Codes and Ordinances.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.
- B. Labeling: Deliver the insulation, coverings, cements, adhesives, and coatings to the site in containers with the manufacturer's stamp or label, affixed showing the fire hazard indexes of products.
- C. Protection: Protect the insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation and remove damaged materials from the project site.

**1.07 JOB CONDITIONS**

- A. Sequencing: Obtain the Engineer's approval of insulation, adhesives, coatings and method of installation before installing any insulation
- B. All duct leaks shall be sealed prior to installation of external insulation to prevent billowing and damage to insulation.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Certainteed Corp.
  - 2. Knauf Fiber Glass GmbH
  - 3. Manville Products Corp.
  - 4. Owens-Corning Fiberglas Corp.

**2.02 MATERIALS**

- A. Exposed Ductwork Insulation (Rigid): All exposed ductwork as listed under Article 3.02 - Ductwork System Insulation, shall be insulated with minimum 1-1/2" thick glass fiber board having a density of not less than 3.0 lbs./cu.ft., and a thermal conductivity of not more than 0.23 BTU-inch/hour square feet °F at 75°F mean temperature. The insulation shall be Johns-Manville No. 814 Spin - Glas, Certain Teed Corporation Industrial Board, or approved equal. The insulation shall be impaled over pins welded to the duct surface on 12" centers. The pins shall be coated with vapor barrier adhesive, and the insulation shall then be secured with caps over the pins. All joints and breaks in the vapor barrier shall be sealed with 3" wide strips of the vapor barrier facing. All insulation shall be reinforced with corner bead. The facing shall be finished with a 3-ply application of lagging adhesive, glass fabric reinforcing and a finish coat of mastic.

- B. **Concealed Ductwork Insulation (Flexible):** All concealed ductwork as listed under Article 3.02 - Ductwork System Insulation, shall be insulated with 1-1/2" thick flexible fiberglass duct insulation, having a thermal conductivity of not more than 0.28 BTU-inch/hour -square feet °F at 75°F mean temperature. The insulation shall have a reinforced foil vapor barrier facing. Insulation shall be secured with 4" wide bands of adhesive on 12" centers. All joints shall be sealed by adhering a 2" sealing lap or 3" strips of vapor barrier facing applied with vapor barrier adhesive. On horizontal ducts over 14" wide, welded pins and clips shall be used on the underside on 18" centers.
- C. **Non-Combustible Duct Warp:** All exposed ductwork as listed under Paragraph 3.02E shall be a 2-inch insulated high temperature inorganic foil encapsulated insulation fiber blanket for duct application requiring two-hour rating. Flamechek Plus 2 duct insulation as manufactured by Certainteed or approved equal.
- D. **Internal Duct Liner Insulation - Acoustical Insulation**
1. **Type:** Fiberglass duct liner board with black surface
  2. **Density:** Minimum 1-1/2 lbs. per cubic foot
  3. **Thickness:** 1-1/2 inch minimum
  4. **Thermal Conductivity:** 0.23 Btu-Inch/HR.FT<sup>2</sup>. °F @ 75°F mean temperature.
- E. **Adhesives and Accessories**
1. **Acoustical Lining Insulation Adhesive:** Insulation shall be applied in cut-to-size pieces attached to the interior of the duct with a nonflammable, fire-resistant adhesive conforming to ASTM C 916, Type I. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire-resistant adhesive to prevent delamination of glass fibers.
  2. **Mineral Fiber Insulation Cement:** Cement shall be in accordance with ASTM C 195.
  3. **Lagging Adhesive:** Lagging adhesive shall be nonflammable and fire-resistant and shall have flame spread and smoke developed rating of 25/50 when measured in accordance with ASTM E 84.
  4. **Contact Adhesive:** Adhesive may be dispersed in non-halogenated organic solvent with a low flash point (flash pint less then minus 25 degrees F when tested in accordance with ASTM D 3278) or, dispersed in a nonflammable organic solvent which shall not have a fire point below 200 degrees F. The adhesive shall be nonflammable and fire-resistant.
  5. **Caulking:** Caulking shall be in accordance wit ASTM C 920.

6. Corner Angles: Nominal 0.016 inch type 316 stainless steel 1 x 1 inch with factory applied kraft backing and adhesive.
7. Finishing Cement: Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449.
8. Fibrous Glass Cloth and Glass Tape: Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E 84.
9. Staples shall be outward clinching Type 316 stainless steel.
10. White Vapor Retarder ASJ (All Service Jacket): For use on ducts. Vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting.
11. Weatherproof Jackets: Type 316 stainless steel jackets shall be smooth sheet, 0.016 inch nominal thickness. Corrugated metal jacket shall not be used outdoors for insulated ducts.

### PART 3 EXECUTION

#### 3.01 INSPECTION

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable for insulation installation.

#### 3.02 DUCTWORK SYSTEM INSULATION

- A. Insulation Omitted: Do not insulate lined ductwork.
- B. Thermal Insulation - Rigid: The following exposed ductwork exposed in room shall be insulated:
  1. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft, or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units, air conditioning units, or supply fans in heated and air conditioned spaces.
  2. All exhaust and return air ductwork from air conditioned spaces.
  3. All supply and return air ductwork associated with Air Conditioning Units.
  4. All heated and air conditioned ductwork located in unheated spaces.

5. All heated and air conditioned ductwork located outdoor shall be insulated and covered with weatherproof stainless steel jacket.
  6. Where indicated on the Contract Drawings.
- C. Thermal Insulation - Flexible: The following ductwork located above hung ceiling shall be insulated:
1. All supply, exhaust and return ductwork associated with air conditioning units.
  2. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units and supply fans.
  3. Where indicated on the Contract Drawings.
- D. Insulation Thickness: All ductwork insulation shall be 1-1/2 inch thick except for outside air intake plenum and outside air ductwork insulation which shall be 2 inches thick.
- E. Non-Combustible Duct Wrap: HVAC ductwork in smoke shaft.
- F. Heat Trace Insulation: Flexible ductwork insulation shall be 1-1/2 inch thick with stainless steel jacketing.
- G. Jackets for Ductwork Insulation: All service jacket ductwork insulation.
- H. Weatherproof Jackets: Use stainless steel jackets where noted on drawings.

### 3.03 INSTALLATION

- A. General: Install ductwork and equipment thermal insulation products in accordance with the manufacturer's recommendations and approved shop drawings, and as specified in Division 1. Install all products in accordance with the recognized industry practices so that insulation serves its intended purpose.
- B. Ductwork Insulation
1. Insulation Surfaces: Install the insulation materials with smooth and even surfaces.
  2. Cleaning and Drying: Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to form a complete and tight fit over the surfaces to be covered.
  3. Integrity: Maintain the integrity of the vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

4. Penetrations: Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
5. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where the internal insulation or sound absorbing linings have been installed.
6. Corner Angles: Except for oven and hood exhaust duct insulation, install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with the jacketing.
7. Follow all manufacturers' installation requirements for non-combustible duct insulation.

#### 3.04 PROTECTION AND REPLACEMENT

- A. Replacement: Replace damaged insulation which cannot be satisfactorily repaired, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Follow methods which are required for protection of the insulation Work during the remainder of construction period, to avoid damage and deterioration.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 15820**  
**DUCTWORK ACCESSORIES**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Ductwork accessories such as turning vanes, volume dampers, splitter dampers, air extractors, duct hardware, access doors, instrument test holes, gravity backdraft dampers, fire dampers and airflow measuring stations.

**1.02 RELATED SPECIFICATIONS**

- A. Section 13581 - Fire Alarm and Detection System
- B. Section 15076 - Piping and Equipment Identification
- C. Section 15810 - Ductwork
- D. Section 15900 - HVAC Controls
- E. Section 15950 - Testing, Adjusting and Balancing

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. SMACNA - HVAC Duct Construction Standards, Metal and Flexible
  - 2. ASHRAE - Handbook - Systems and Equipment; Recommendations pertaining to construction of ductwork accessories
  - 3. UL 555 - Fire Dampers and Ceiling Dampers
  - 4. UL 33 - Heat Responsive Links for Fire Protection Services
  - 5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit catalog product data indicating dimensions, assembly, materials and finishes, and operation and performance data.
- C. Shop Drawings: Submit shop drawings for shop fabricated assemblies. Provide product data for the hardware used.
- D. Operation and Maintenance Data: Submit the manufacturer's installation, maintenance, and repair data as specified in Section 01831 including a parts lists for each type of duct accessory. Include this data, product data, and shop drawings in the operation and maintenance manual.



## 1.05 QUALITY ASSURANCE

- A. Provide equipment from manufacturers regularly engaged in the design and manufacture of ductwork accessories, of the types and sizes required, which have a minimum of three (3) years documented experience and which issue complete catalog data on these products.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Storage and Protection: Store products in a clean, dry place and protect from physical damage in their original shipping packings, with labeling in place until the time of installation.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Turning Vanes
  - 1. Aero Dyne Co.
  - 2. Tuttle and Bailey
- C. Volume Dampers
  - 1. Ruskin Mfg. Co.
  - 2. Vent Product Co.
- D. Air Extractors
  - 1. Barber-Colman Co.
  - 2. Titus
- E. Duct Hardware
  - 1. Ventfabrics Inc.
  - 2. Young Regulator Co.
- F. Access Doors
  - 1. Air Balance Inc.
  - 2. Ruskin Mfg. Co.
  - 3. Ventfabrics Inc.

## G. Instrument Test Holes

1. Ventfabrics Inc.
2. Young Regulator Co.

## H. Gravity Backdraft Dampers

1. Air Balance Inc.
2. American Warming and Ventilating Inc.
3. Ruskin Mfg. Co.

## I. Fire Dampers

1. Air Balance Inc.
2. American Warming and Ventilating Inc.
3. Ruskin Mfg. Co.

## J. Combination Fire/Smoke Dampers

1. Ruskin Mfg. Co.
2. Nailor-Hart

## 2.02 MATERIALS

A. General: Provide ductwork accessories of the same materials as the duct, if commercially available. Otherwise fabricate such ductwork accessories of Type 316L stainless steel, protected inside and outside with a factory applied 4-6 mil heresite, or equal, air dried phenolic coating. Construct duct accessories in accordance with SMACNA "HVAC Duct Construction Standards."

B. Turning Vanes: Provide turning vanes as follows:

1. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed of the same material as the associated ductwork in accordance with SMACNA "HVAC Duct Construction Standards".
2. Manufactured Turning Vanes: Factory fabricate turning vanes of a streamlined design, with single thickness vanes not more than 1-1/2 inch apart for ducts 24 inches and smaller and with double thickness vanes spaced 3-1/4 inches apart for ducts larger than 24 inches.
3. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusion with perforated faces and fiberglass fill.

C. Volume Dampers

1. Reference: SMACNA Standards.
2. Material: As specified for ductwork.
3. Blades: Opposed blades, vinyl edge seals.
4. Provide outside handle, quadrant and approved position indicator and locking device.
5. Performance
  - a. Damper Leakage: Not more than 16 cfm per square foot at 4-inch W.G.
  - b. Certification: Manufacturer shall provide certified test data.

D. Air Extractors: Provide air extractors capable of providing uniform air distribution and designed to minimize pressure drop and turbulence.

E. Duct Hardware: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Quadrant Locks: Provide for each damper, a quadrant lock device on one end of the shaft; and an end bearing plate on the other end for damper lengths over 12 inches. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
2. Damper Remote Drives: Provide remote flexible drive where specified, complete with flexible couplings, linkages and concealed type regulators for flush ceiling mounting.

F. Access Doors: Provide duct and plenum access doors where necessary to service or replace equipment. Construct doors of the same or greater gauge as the ductwork or plenums served. Provide insulated doors for insulated ductwork and plenums. Provide insulated doors as double wall type insulated with 1-inch 6-pound density glass fiber, with suitable reinforced edges, closing into structurally framed openings with 1/2-inch neoprene-lined channels. Provide door panels with double diagonally cross breaks, hinged with two or more butt hinges and secured with two or more compression latches. Provide plenum doors with latch handles on both the inside and outside. Provide flush frames for uninsulated ductwork, and extended frames for externally insulated duct. Provide one side hinged and the other side with one handle-type latch for doors 12 inches high and smaller or 2 handle-type latches for larger doors.

- G. Test Holes: Provide instrument test holes in the ducts and plenums at appropriate locations for insertion of 3/4-inch pitot tubes and similar air measuring instruments. Equip the openings with removable, tight fitting caps or covers.
- H. Gravity Backdraft Dampers
1. Provide counterbalanced interlinked backdraft dampers at gravity relief locations shown and as specified. Construct the dampers complete with jamb and blade seals, nonmetallic bearings, and adjustable counterbalance on extended shaft. Provide dampers suitable for operation at a maximum of 4 inches w.g. and a pressure drop not exceeding 0.2 inches w.g.
- I. Fire Dampers: Provide, where shown Type B fire dampers, of the sizes indicated, complete with necessary sleeves, chains and fusible links, and in compliance with NFPA and UL listed. Construct casings and sleeves of Type 316 stainless steel. Provide fusible links rated at 160 to 165 degrees F unless otherwise indicated. Provide dampers with a positive lock in the closed position, and with the following additional features:
1. Damper Blade Assembly: Curtain type
  2. Blade Material: Steel, match casing
- Provide an access door constructed of the same gauge metal as the duct, complete with suitable hinges, latches and gaskets, to permit link replacement at each fire damper.
- J. Combination Fire/Smoke Dampers: Provide combination fire dampers and 115 volt motor operated smoke dampers with end switches, complete with necessary chains and factory sleeve, conforming to NFPA requirements, and listed and classified by UL Inc. as Class 1 low leakage rated combination fire/smoke damper. Fire/smoke damper shall be equipped with a heat-actuated release device to provide controlled closure and prevent duct and HVAC component damage. Instantaneous damper closure due to use of fusible links is unacceptable. Provide fire/smoke damper with the ability to be remotely reset. Provide an access door constructed of the same gauge metal as the duct, complete with suitable hinges, latches and gaskets, to permit manual damper reset.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. General: Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Install ductwork accessories in accordance with the manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function. Make all necessary adjustments to provide a complete and satisfactory operation upon completion of the installation.
- B. Turning Vanes: Install turning vanes in square or rectangular 90 degree elbows in supply, return and exhaust air systems, and elsewhere as indicated.
- C. Volume Dampers: Install volume dampers in main ducts and branch ducts and at all return and exhaust air branch duct take off connections and all other locations where shown.
- D. Extractors: Install air extractors behind all supply registers and all other locations where shown.
- E. Duct Hardware: Install locking quadrant controls for each volume damper.
- F. Access Doors: Install access doors to open against system air pressure, with latches operable from either side, except outside only where the duct is too small for a person to enter. Provide access doors, amply sized to suit their function, in ducts and plenums for inspection and cleaning, at maximum 50 foot spacing, coils, fans, volume dampers, automatic dampers, fire and smoke dampers, turning vanes as necessary to service or required to replace equipment.
- G. Instrument Test Holes: Provide instrument test holes in ducts and plenums where required for testing and balancing purposes.
- H. Gravity Backdraft Dampers: Install backdraft dampers at gravity relief locations and where shown.
- I. Fire Dampers: Install fusible link fire dampers in all ducts passing through fire rated building walls, floors and partitions indicated on the architectural drawings and where shown.
- J. Coordination: Coordinate as necessary to interface installation of ductwork accessories properly.

### 3.03 FIELD QUALITY CONTROL

- A. Tests: Operate installed ductwork accessories to demonstrate their compliance with the specified requirements. Test for air leakage while the system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

- B. Manufacturer's Field Services: Provide the services of a qualified representative of the manufacturer as specified in Division 1 to inspect the installation of equipment, certify that it meets the manufacturer's recommendations, and instruct the operating personnel in its operation and maintenance.

3.04 ADJUSTING AND CLEANING

- A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
  - 1. Label access doors in accordance with the requirements of Section 15076 - Piping and Equipment Identification.
  - 2. Final positioning of manual dampers is specified in accordance with the requirements of Section 15950 - Testing, Adjusting and Balancing.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with the manufacturer's touch-up paint.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 15830  
FANS****PART 1 GENERAL****1.01 SUMMARY**

A. Section Includes: The following types of fans:

1. Roof-mounted fans
2. Propeller fans
3. Vane axial fans
4. Tubeaxial fans
5. In-line square centrifugal fans

**1.02 RELATED SPECIFICATIONS**

- |    |               |   |  |
|----|---------------|---|--|
| A. | Section 09911 | - | Exterior Painting                                    |
| B. | Section 09912 | - | Interior Painting                                    |
| C. | Section 15071 | - | Vibration Control                                    |
| D. | Section 15900 | - | HVAC Controls  |
| E. | Section 16055 | - | Electrical Requirements for Shop Assembled Equipment |
| F. | Section 16220 | - | Electric Motors                                      |
| G. | Section 16491 | - | Control Components and Devices                       |

**1.03 REFERENCES**

A. Codes and standards referred to in this Section include:

- |    |                |   |   |
|----|----------------|---|---|
| 1. | AMCA 99        | - | Standards Handbook  |
| 2. | AMCA 210       | - | Laboratory Methods of Testing Fans for Rating Purposes            |
| 3. | AMCA 300       | - | Reverberant Room Method for Sound Testing of Fans                 |
| 4. | AMCA 301       | - | Method of Calculating Fan Sound Ratings from Laboratory Test Data |
| 5. | AFBMA 9        | - | Load Ratings and Fatigue Life for Ball Bearings                   |
| 6. | AFBMA 11       | - | Load Ratings and Fatigue Life for Roller Bearings                 |
| 7. | ASTM A 27/A27M | - | Specification for Steel Castings, Carbon, for General Application |



- 8. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
- 9. NEC - National Electrical Code
- 10. NEMA - National Electrical Manufacturers Association
- 11. SMACA - HVAC Duct Construction Standards
- 12. SSPC-SP1 - Solvent Cleaning
- 13. SSPC-SP2 - Hand Tool Cleaning
- 14. SSPC-SP3 - Power Tool Cleaning

#### 1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Submit complete catalog product data, including the following:
  - 1. Dimensions
  - 2. Assembly
  - 3. Weights
  - 4. Specialties and accessories
  - 5. Rated capacities
  - 6. Performance ratings
  - 7. Controls
  - 8. Certified fan performance curves with system operating conditions indicated, including brake horsepower, static pressure, and static efficiency plotted against air volume for the duty scheduled
  - 9. Certified fan sound power ratings, for both fan outlet and casing radiation at rated capacity
  - 10. Motor ratings and electrical characteristics plus motor and fan accessories
  - 11. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.

- 12. Materials gauges and finishes, including color charts
- 13. Dampers, including housings, linkages, and operators
- C. Shop Drawings: Submit shop drawings detailing equipment assemblies and indicating locations, dimensions, weights, required clearances, construction details, and location and size of field connections.
- D. Operation and Maintenance Manuals: Submit manufacturer's descriptive literature, as specified in Section 01831, including operation instructions, lubrication instructions, motor and drive replacement instructions, wiring diagrams, controls, accessories maintenance and repair data, and parts listing. Include this data and product data in the operation and maintenance manual.

#### 1.05 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and place the AMCA Certified Rating Seal on the equipment.
- B. Sound Ratings: Conform to AMCA 301, test to AMCA 300 and place the AMCA Certified Sound Rating Seal on the equipment.
- C. Fabrication: Conform to AMCA 99.
- D. Fans and Components: Provide UL listed and labeled fans and components.
- E. Motors and Electrical Accessories: Comply with NEMA standards and NEC.
- F. Manufacturer: Provide equipment from a company regularly engaged in design and manufacture of fans, of types and capacities required, whose products have been in satisfactory use in similar service for not less than three (3) years documented experience, and which issues complete catalog data on these products.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 1 and as follows:
- B. Delivery and Handling: Deliver products to site in factory fabricated protective containers. Handle products properly to prevent damage, breaking, denting and scoring. Do not install damaged equipment. Replace damaged units with new. Comply with manufacturer's instructions for unloading and transporting equipment to final location.
- C. Storage and Protection: Store equipment in its original containers with labeling in place until the time of installation and as specified in Division 1.

1.07 SEQUENCE AND SCHEDULING

- A. Equipment Roof Supports: Coordinate the installation of roof curbs, equipment supports, and roof penetrations.
- B. Structural Supports: Coordinate the size and location of structural steel support members.

1.08 SPARE PARTS

- A. Furnish spare parts wrapped or boxed, indexed and tagged with complete information for use and reordering. Provide the following spare parts.
  - 1. One complete set of belts for each belt-driven fan.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Air-Dried Phenolic Coating
  - 1. Heresite - VR500 Series
- C. Roof-Mounted Fans
  - 1. Greenheck Fan Corp.
- D. Roof Curbs
  - 1. Penn Ventilation Co.
  - 2. Thybar Corp.
  - 3. Pate
- E. Propeller Fans
  - 1. Greenheck Fan Corp.
  - 2. Penn Ventilator Co.
- F. Vane Axial Fans
  - 1. Greenheck Fan Corp.
  - 2. Hartzell Fan Inc.

## G. Tubeaxial Fans

1. Greenheck Fan Corp.
2. Hartzell Fan Inc.

## H. In-Line Square Centrifugal Fans (Belt Drive)

1. Greenheck Fan Corp.

## 2.02 FANS GENERAL

- A. General Design: Assemble and test fans of the arrangement, minimum size, capacities and characteristics scheduled.
- B. Fan Performance: Provide fans tested and rated in accordance with Air Movement and Control Association, Inc. (AMCA) test procedures, bearing the AMCA rating seal. Provide certified performance curve for each fan.
- C. Fans and Shafts: Provide fans statically and dynamically balanced at the factory. Design fans for continuous operation at the maximum rated fan speed and motor horsepower. Provide turned, ground, and polished steel fan shafts designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class.
- D. Belt Drives: Provide drives of a V-belt type, factory mounted, with final alignment and belt adjustment made after installation. Provide V-belt drives which have a minimum service factor of 1.5 based on motor horsepower.
- E. Belts: Provide V-belt type belts in matched sets. Provide oil-resistant, nonsparking, and nonstatic belts.
- F. Motor and Fan Wheel Pulleys: Use adjustable pitch motor sheaves with motors through 15 hp; use fixed pitch motor sheaves on larger than 15 hp motors with adjustable pitch fan sheaves. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions. Include an allowance to replace motor and fan wheel pulleys as required to obtain required airflow during final air balance of system.
- G. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan housing.
- H. Shaft Bearings: Provide self-aligning grease lubricated bearings of the type indicated having a median life "Rating Life" AFBMA L50 of 200,000 hrs., calculated in accordance with ANSI/AFBMA Standard 9 for ball bearings and ANSI/AFBMA Standard 11 for roller bearings.
- I. Lubrication: Provide fan lubrication fittings extended to the service side with aluminum tubes and secured accessibly outside the fan housing.

- J. Protective Coating: Provide protective coating meeting the following requirements:
1. Air-Dried Phenolic Coating: Where an air-dried phenolic corrosion-resistant coating is required, thoroughly clean, prepare and protect against corrosion all metal parts of the unit with one coat of primer and at least two coats of an air-dry phenolic corrosion-resistant coating to obtain a minimum total dry film thickness of 4 to 6 mils.
  2. Manufacturer Recommendation: Perform cleaning and coating procedures as specified and in accordance with the coating manufacturers published recommendations. As a minimum provide SSPC-SP3 Power Tool Cleaning.
- K. Controls: Provide controls furnished with equipment meeting the requirements of Sections 15900 - HVAC Controls and in accordance with the requirements of Section 16055 - Electric Requirements for Shop Assembled Equipment.
- L. Motors: Provide TEFC high energy efficient type motors in accordance with the requirements of Section 16220 - Electric Motors of the Electrical Contract, except that in designated hazardous areas provide explosion-proof type motors. Provide motors, electrical equipment and wiring located in hazardous areas or in airstreams exhausted from these areas meeting NEC electrical hazard classification requirements shown and as specified. Provide mill and chemical duty motors where shown.
- M. Electrical Equipment: Provide all electrical equipment and materials, including combination motor starters, circuit breakers and disconnect circuit breakers in accordance with the requirements of Section 16491 - Control Components and Devices.
- N. All fans shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A, in accordance with the City of New York Building Code and the referenced Uniform Building Code.
- 2.03 ROOF-MOUNTED FANS
- A. General: Provide roof-mounted fans of the centrifugal type as noted, of the minimum size and capacity scheduled and belt driven unless noted otherwise. Provide roof-mounted fans complete with curb cap, 1/2-inch mesh aluminum bird screen, integral disconnect switch, extended lubrication lines, and either a gravity, pneumatic or electrically operated interlinked back draft damper as noted on the fan schedule or as specified in Section 15900 - HVAC Controls.
- B. Housing: Provide fan housing constructed of aluminum. Provide removable dome top and outlet baffle type housing, designed to provide easy access to the fan, bearings, shaft and motor.
- C. Wheel: Provide fan impellers constructed of aluminum with backward inclined blades.

- D. Motors: Provide motors for belt-driven fans with an adjustable mounting for adjusting belt tension, and the motor and drive housed in a weatherproof ventilated compartment outside of the airstream.

#### 2.04 ROOF CURBS

- A. Provide prefabricated roof curbs of types as required and shown. Provide curbs of monolithic construction, 14 gauge galvanized steel, with continuous arc-welded corner seams, galvanized steel inner liner, factory-installed wood nailer and insulated with 1-1/2-inch thick, 3-pound density rigid fiberglass board insulation. Provide curbs with a minimum height of 12 inches above the finished roof deck and of the style and design to mate the deck. Provide all curbs with tops leveled, with pitch built into curb where roof slopes 1/4 inch per foot or more.

#### 2.05 STEEL PROPELLER FANS

- A. General: Provide propeller fans which meet the minimum size, capacity and arrangement as scheduled, and are belt driven unless shown otherwise.
- B. Construction: Provide each propeller fan comprised of a heavy-gauge steel panel with folded edges and integral venturi, rigid steel motor and drive assembly frame, motor, adjustable pitch motor sheave, V-belts, fan sheave and a dynamically and statically balanced propeller blade assembly. Bolt fan guards fabricated of heavy-gauge galvanized wire to the steel panel at the motor and discharge sides unless noted otherwise.
- C. Damper: Provide a gravity, pneumatic or electrically operated back draft damper as noted, comprised of a heavy-gauge welded steel frame with aluminum interlinked blades with neoprene edge seals, and linkage. (Provide gravity dampers mounted at aluminum propeller fans of all aluminum construction.)

#### 2.06 VANE AXIAL FANS

- A. General: Provide vane axial fans meeting the minimum size, capacity, performance ratings and arrangement as scheduled.
- B. Construction: Provide vane axial fans complete with mounting feet or brackets as required, heavy-duty self-aligning bearings, matched V-belts, fan sheave, adjustable motor sheave permitting adjustment of at least 5 percent adjustment above the below rated cfm, belt guard, adjustable motor support, shaft seal and extended lubrication fittings.
- C. Housing and Wheel: Construct the fan housing and fan wheel of heavy-gauge steel. Provide the fan wheel with steel airfoil section blades driven by a V-belt drive and totally enclosed motor. Properly key and secure fan wheels on the fan shaft.

- D. Vanes: Weld heavy-gauge aerodynamically designed straightening vanes in the fan casing.
- E. Sound Level: Design fans such that the sound level at the outlet of the fan does not exceed 82 and 81 dB in the second and third octave band when operating at 700 rpm.
- F. Vibration Isolation: Mount vaneaxial fans on neoprene vibration isolators. Provide neoprene vibration isolators meeting the requirements specified in Section 15071 - Vibration Control.
- G. Motors: Provide mill and chemical duty type motors for tubeaxial fans in accordance with the requirements of Section 16220 - Electric Motors.

## 2.07 TUBEAXIAL FANS

- A. General: Provide tubeaxial fans which meet the minimum size, capacity and performance as scheduled.
- B. Assembly: Provide V-belt driven duct axial fans constructed of continuously welded steel with inlet and outlet flanges, impeller blades shall be airfoil type steel propeller statically and dynamically balanced on the fan shaft, fan shaft with belt tube with cover plate, heavy-duty self-aligning ball type relubricable bearings with sealed bearing covers and extended lube lines to the outside of the housing, steel mounting brackets, motor mounted on adjustable base plate, variable pitch drive, drive guard, and matched V-belts.
- C. Construction: Provide all structural parts in the airstream made of steel.
- D. Motors: Provide motors for tubeaxial fans as specified in Section 16220 - Electric Motors.

## 2.08 IN-LINE SQUARE CENTRIFUGAL FANS

- A. In-line square fans shall be of centrifugal belt driven in-line type. The fan housing shall be of the square design constructed of heavy gauge all steel and shall include square duct mounting collars.
- B. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
- C. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- D. Motors and drives shall be mounted out of the airstream with combination motor cover and belt guards. Motors shall be readily accessible for maintenance.

- E. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings
- F. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for system balancing.

## 2.09 SOURCE QUALITY CONTROL

- A. Tests: Perform the following factory tests:
  - 1. Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating." Provide fans which are licensed to bear the AMCA Certified Sound Ratings Seal.
  - 2. Units Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. General: Examine equipment and field conditions as follows.
  - 1. Examine fans at the time of delivery for damaged or missing components.
  - 2. Examine areas and conditions for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans.
  - 3. Do not proceed until unsatisfactory conditions have been corrected.
- B. Power Supply: Verify that the proper power supply is available.

### 3.02 INSTALLATION

- A. General: Install equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Make all necessary adjustments to equipment to provide complete and satisfactory operation upon completion of the installation.



- B. Support fans as described below.
1. Support floor-mounted units on concrete equipment bases using housed spring isolators. Secure units to anchor bolts installed in concrete equipment base.
  2. Install prefabricated roof mounting curbs for roof-mounted fans, watertight in accordance with the prefabricated curb manufacturer's recommendations. Secure roof-mounted fans to roof curbs. Set each fan on a continuous 2- by 1/2-inch sponge neoprene gasket. Flange connecting ducts over the wood mounting frame attached to the fan curb. Provide roof openings in accordance with approved manufacturers shop drawing submittals.
  3. Suspend overhead mounted units from structural steel support frame using threaded steel rods and vibration isolation springs.
- C. Vibration Correction: If undesirable vibration occurs in the fan after installation, rebalance the fan in the field or replace to achieve operation within acceptable limits.
- D. Access Space: Provide access space around fans and motors for service. Provide no less than minimum as recommended by the manufacturer. Allow space for motor removal.
- E. Electrical Leads: Install fans, as shown and specified, with flexible electrical leads.
- F. Flexible Connections: Provide flexible connections at inlet and discharge of fans where shown. Ensure metal bands of flexible connectors are parallel with minimum 1-inch flex between ductwork and fan while running. Flexible connections are not to be in tension while fan is running.
- G. Safety Screen: Provide safety screen where fan inlet or outlet is exposed.
- H. Drain Piping: Pipe fan scroll drains to nearest floor drain.
- I. Backdraft Dampers: Provide backdraft dampers on discharge of exhaust fans and as indicated.
- J. Operating Requirements: Do not operate fans for any purpose until ductwork is clean, bearings are lubricated, and fans have been test run under observation.
- K. Access Doors: Provide access doors for all fans, for inspection and maintenance.
- L. Lubrication: Properly lubricate all pieces of equipment, furnished with lubrication fittings, prior to start-up and at recommended intervals before turning equipment over to the City of New York. Attach a linen tag or heavy-duty shipping tag to each piece of equipment showing the date of lubrication and the name and number

of lubricant used. Furnish typewritten list, in triplicate, of each item lubricated and the type of lubricant used.

3.03 FIELD QUALITY CONTROL

A. Adjustment and Cleaning: Perform adjusting and cleaning as follows:

1. Align, adjust and balance each belt drive to prevent noise and vibration.
2. Adjust damper linkages for proper damper operation.
3. Start fan system and check for excessive leaks and vibration and correct.
4. Remove all loose materials and obstructions from interior of equipment.
5. Remove debris and waste materials resulting from installation.
6. Clean tar, adhesive, dirt or marks from exterior of unit.

B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to inspect the installation of equipment, and certify that it meets the manufacturer's recommendations as specified in Division 1. Make any necessary adjustments, test and place the equipment in satisfactory operating condition and instruct the operating personnel in its operation and maintenance.

3.04 PAINTING

A. Paint fans in accordance with the requirements of Sections 09911 and 09912 - Exterior and Interior Painting.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 15850**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for furnishing and installing ceiling air diffusers, registers, grilles, gravity ventilators, and all accessories and appurtenances necessary for complete installation.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. SSPC-SP3 - Power Tool Cleaning

**1.04 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Submit manufacturer's technical product data for air outlets and inlets including the following:
  - 1. Data sheet for each type of air outlet and inlet, and accessory furnished, indicating construction, finish and mounting details.
  - 2. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop; and noise criteria ratings. Indicate selections on data.
- C. Shop Drawings: Submit shop drawings for air outlets and inlets including the following:
  - 1. Manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.
  - 2. Schedule of outlets and inlets indicating type, size, location, application, and noise level.
- D. Quality Control: Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules.

- E. Operations and Maintenance Manuals: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals, in accordance with requirements of Section 01831.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than three (3) years.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Shipping and Packing: Deliver air outlets and inlets wrapped in factory-fabricated fiberboard type containers. Identify on outside of container, the type of outlet or inlet, and location to be installed. Provide complete information for use and reordering, including supplier's name, address and phone number.
- C. Storage and Protection: Store air outlets and inlets in original cartons and protect them from weather and construction Work traffic. Where possible, store indoors. When necessary to store outdoors, store above grade and enclose with waterproof wrapping. Avoid crushing or bending, and prevent dirt and debris from entering and settling in devices.
- D. Inspection: Inspect all air outlets and inlets against approved shop drawings at the time of delivery.

Return for replacement all air outlets and inlets damaged or not meeting the requirements of the approved drawings.

#### 1.07 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. Three sets of operating keys for each type of air outlet and inlet that require them.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

**B. Ceiling Air Diffusers**

1. Titus Products; Division of Philips Industries, Inc.
2. A. J. Manufacturing Co.

**C. Registers and Grilles**

1. Titus Products; Division of Philips Industries, Inc.
2. A. J. Manufacturing Co.

**D. Air Boot****2.02 MATERIALS, GENERAL**

- A. Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers, registers and grilles, and gravity ventilators where shown, of size, shape, capacity, and type indicated, constructed of materials and components as indicated, and as required for complete installation.
- B. Ceiling/Surface Compatibility: Provide diffusers, registers and grilles with border styles that are compatible with adjacent construction systems, and that are specifically manufactured to fit into ceiling module or wall construction with accurate fit and adequate support. Refer to Contract Drawings and Specifications for types of ceiling systems and surfaces which will contain each type of air diffuser, register and grille.

**2.03 CEILING AIR DIFFUSERS**

- A. Provide ceiling air diffusers materials and coatings as follows:
  1. Type 316 stainless steel in stainless steel ducts
- B. Square and Rectangular Ceiling Diffusers: Provide square and rectangular ceiling diffusers where shown and specified meeting the following requirements.
  1. Provide square or rectangular, adjustable pattern, stamped, perforated face type ceiling diffusers to discharge air in 4 direction pattern with sectorizing baffles where indicated. Type 316 stainless steel, Model SSPERF-S manufactured by A.J. Manufacturing Co. or approved equal.
  2. Provide 24 inch x 24 inch ceiling module panel to fit in lay-in ceiling space.
  3. Provide opposed blade dampers with equalizing grid, with damper adjustable from diffuser face.
  4. Provide square to round transitions for Model SSPERF-S.

## 2.04 REGISTER AND GRILLES

- A. Provide registers and grilles materials as follows:
  - 1. Type 316 stainless steel in stainless steel ducts
- B. Supply Registers and Grilles: Provide supply registers and grilles where shown and specified meeting the following requirements.
  - 1. Provide supply air registers and grilles as double deflection type, with individually adjustable vertical front blades, flanged and gasketed. Type 316 stainless steel - Model SS250V, manufactured by A.J. Manufacturing Co. or approved equal.
  - 2. Fabricate 1-1/4 inch margin frames with concealed mounting.
  - 3. Provide air extractors and integral, gang-operated opposed blade dampers with a removable key operator, operable from the face.
- C. Exhaust and Return Registers and Grilles: Provide exhaust and return registers and grilles where shown and specified meeting the following requirements.
  - 1. Provide exhaust and return air registers and grilles as single deflection type, with fixed horizontal blades set at 45 degrees deflection, flanged and gasketed; Type 316 stainless steel - Model SS550H, manufactured by A.J. Manufacturing Co., or approved equal, flanged and gasketed or approved equal.
  - 2. Fabricate 1-1/4 inch margin frames with concealed mounting.
  - 3. Provide integral, gang-operated opposed blade dampers with a removable key operator, operable from the face.
- D. Provide ceiling mounted perforated return air registers where shown and specified meeting the following requirements.
  - 1. Provide square or rectangular, stamped, perforated face type ceiling registers where indicated. Type 316 stainless steel or approved equal - Model SSPERF-R, manufactured by A.J. Manufacturing Co. or approved equal.
  - 2. All registers to be mounted in 24 inch x 24 inch ceiling module panel, to fit in lay-in ceiling space.
- E. Provide surface mounted eggcrate grilles with 1/2 x 1/2 x 1/2 inch, aluminum core where indicated on plans, manufactured by Titus, Model No. 50F or approved equal.

- F. Transfer Grille Assembly: Wall mounted grilles shall consist of two (2) grilles, installed flushed to each side of wall. A Type B fire damper shall be installed between the grilles when located in fire rated walls. The fire damper shall consist of a fully adjustable, key operated opposed blade damper with a spring loaded fusible link assembly Type 316 stainless steel construction. The fusible link shall be UL rated at 160F. The entire assembly shall conform to the latest edition of the National Fire Code No. 90A. All transfer grilles assembly shall be Type 316 stainless steel. Transfer grilles shall be as manufactured by A.J. Manufacturing Co., or approved equal.

## 2.05 AIR BOOT

- A. Provide air boot constructed of Type 316 stainless steel as indicated on "Air Boot Detail" in Contract Drawings.

## 2.06 SOURCE QUALITY CONTROL

- A. Performance: Provide air inlets and outlets meeting the following performance requirements.
  - 1. Provide ceiling air diffusers, registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
  - 2. Provide gravity ventilators that have, as maximum, face velocity and pressure drop across the unit, and as minimum, noise criteria ratings for each size product as listed in manufacturer's current data.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. General: Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with installation Work until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Install air outlets and inlets, in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Coordination: Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Location: Locate ceiling air diffusers, registers and grilles, as indicated on the "Reflected Ceiling Plans" included in the Contract Drawings. Unless otherwise indicated, locate units in center of acoustical ceiling module.



- D. Connecting Ductwork: Flange connecting ductwork over the mounting frame attached to the roof curb.
- E. Curb Gasket: Set each louver penthouse on a continuous 2- by 1/2-inch thick sponge neoprene gasket.
- F. Construction Openings: Provide roof openings in accordance with approved manufacturers shop drawing submittals.
- G. Painting: Paint visible interior duct surfaces behind grilles and registers flat black in accordance with the requirements of Sections 09911 - Exterior Painting and 09912 - Interior Painting.

-END OF SECTION-

**Section 15900**  
**HVAC CONTROLS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for providing electronic/electric, and direct digital control (DDC) temperature control systems for heating, ventilating, and air conditioning systems as indicated. Provide systems complete in all respects, including thermostats, smoke detectors, thermometers, timers, relays and switches, automatic dampers, damper operators, signal selectors, transmitters, DDC systems with all peripheral devices, DDC software, miscellaneous accessories, temperature control panels (TCP), and alarm systems. Provide all control panels rated NEMA 12.

**1.02 RELATED SPECIFICATIONS**

- |    |               |   |  |
|----|---------------|---|--|
| A. | Section 01821 | - | Training   |
| B. | Section 09911 | - | Exterior Painting                                    |
| C. | Section 09912 | - | Interior Painting                                    |
| D. | Section 15551 | - | Chimney Automation System                            |
| E. | Section 15670 | - | Condensing Units                                     |
| F. | Section 15720 | - | Air Handling Units                                   |
| G. | Section 15730 | - | Packaged Air Conditioning Units                      |
| H. | Section 15765 | - | Terminal Heat Transfer                               |
| I. | Section 15946 | - | Air Monitoring                                       |
| J. | Section 15950 | - | Testing, Adjusting and Balancing                     |
| K. | Section 16055 | - | Electrical Requirements for Shop Assembled Equipment |
| L. | Section 16491 | - | Control Components and Devices                       |

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
1. AMCA 500 - Test Methods for Louvers, Dampers and Shutters
  2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
  3. ASTM B 32 - Solder Metal
  4. NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum)
  5. NFPA 90A - Installation of Air Conditioning and Ventilation Systems

6. ASTM B 280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
7. NEMA DC 3 - Residential Controls - Electric Wall-Mounted Room Thermostats

#### 1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Product Data: Provide complete catalog data for all proposed control components including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts and installation instructions.
- C. Shop Drawings: Provide shop drawings for the following:
  1. Complete data on all proposed control components
  2. Dimensioned external and internal control panel layouts, with components identified
  3. Bills of material for all control components
  4. Control sequence description for each system
  5. Catalog cuts for all devices and equipment
  6. Control diagrams specific to this project. General control diagrams are not acceptable.
  7. Furnish a connection diagram and schematic for each piece of equipment that is specific to this project. A manufacturer's standard connection diagram or schematic showing more than one method of wiring is not acceptable unless the intended method is clearly marked.
  8. DDC data points, system panels to which they are connected, input/output devices, associated alarm limits and alarm messages, point identification numbers and necessary appurtenances
  9. System graphics for all DDC monitored points
  10. DDC system configuration with all peripheral devices, battery backup power conditioning, interconnection diagrams, etc
  11. Software listings for all control loops and each point in the system
  12. Computer system drawings

13. Point-to-point electrical interconnection and loop diagrams (These are needed in the early phase of the project.) Clearly differentiate between manufacturers' wiring and field wiring
  14. Factory and field test Procedures
  15. Damper schedule including sizes, trim, operator sizes and pressure drop calculations
  16. Air temperature sensor schedule including range, element type, element length accuracy, hysteresis, linearity, power requirements and mounting details
  17. Detailed operating instructions
  18. Complete plan wiring, riser and schematic diagrams, and terminal connection diagrams
  19. Calculations and all other details required to demonstrate the system design has been coordinated and will properly function as a system. Submit all sensor range calculations.
- D. Field and Panel Instruments: Provide instruments which contain the following information, as a minimum.
1. Tag number per the Specifications and Contract Drawings
  2. Product (item) name used herein and on the Contract Drawings
  3. Name of manufacturer or supplier
  4. Manufacturer's complete model number
  5. Location of the device
  6. Input-output characteristics
  7. Range, size, graduations and the operating power requirement
  8. Physical size with dimensions, NEMA enclosure classification and mounting details
  9. Materials of construction of all components
  10. Instrument or control device sizing calculations, where applicable
  11. Certified calibration data on all flow metering devices, where applicable

12. Environmental requirements during storage and operation
  13. Verify the process data with the equipment manufacturers and submit completed data sheets. The Contractor is responsible for developing process data on remaining instruments.
- E. DDC Shop Drawings: Submit shop drawings (ladder diagrams, etc.) or Direct Digital Controller shop drawings (DDC configuration printouts, etc.) for review several weeks before the factory acceptance tests. Provide descriptions and reference to rung numbers in the program drawings. Clearly define all assumptions made relative to the derivation of each equation and program module. Include extensive comments in ladder diagrams to describe program steps. Provide a complete detailed listing of all DDC configuration sheets, side loops, global and local points. Submit following documents as a minimum:
1. A complete input-output list for all DDCs
  2. DDC card I/O layout
  3. Cross-reference table. This table will list all registers and coils description with reference to the rung numbers.
  4. DDC configuration data including input/output assignment; memory organization and communication baud rate
  5. Logic diagram or complete ladder diagrams and complete annotation and rung description indicating rung and I/O usage
  6. Manufacturer's application programming manual and software
- F. Catalog Cuts: Submit for review, the name of the manufacturer, identifying trade name and/or model designation, and catalog cuts for all equipment and material proposed under this Section. Provide catalog cuts certified for the tag numbers and ratings of the equipment being supplied. Clearly indicate on the catalog data the equipment and devices specifically being proposed.
- G. Electrical Interconnection and Loop Diagrams: Provide point-to-point electrical interconnection diagrams and loop diagrams during early phase of the project. Prepare instrument loop diagrams per ISA Standard S5.4 and show one loop per sheet. Show all equipment designations, terminal numbers, wire numbers, conduit numbers, cable designations and junction box numbers, etc on the final interconnection wiring diagrams.

- H. Configuration Data Sheet: Submit completed Configuration Data Sheets For all DDC cards and programmable instruments.

Include the following data:

1. Equipment ID (Tag No.)
  2. Manufacturer
  3. Model No.
  4. Zero settings
  5. Span settings
  6. Service
  7. Tuning constants
- I. Application Software for DDC: Provide five copies of a software documentation book which contains programs developed for this project.
- J. Operation and Maintenance Manuals: Submit operation and maintenance manuals covering the function, operation and maintenance of all control components and systems including the DDC control system as specified in Section 01831.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer: Provide materials and equipment which are standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers latest design that conforms to these specifications. Provide the products of the same manufacturers when two or more units of the same class of material and equipment are required.
- B. Installer: Must specialize in installing the Work of this Section and have substantial years documented experience.
- C. DDC System Supplier: Provide DDC supplier staffed with factory-trained engineers fully capable of providing instruction, routine maintenance and emergency maintenance service on all system components.
- D. Manufacturer's Representative: During the DDC startup furnish the services of a qualified, factory-trained service engineer to assist in installation, start-up, field testing, calibration, placing into operation and provide training for the DDC system.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 1 and as follows.
- B. Acceptance: Accept products on-site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect products for damage.

- C. Storage and Protection: Store products in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

#### 1.07 SPARE PARTS

- A. Provide all of the individual manufacturer's recommended spare parts and tools for all equipment specified herein. In addition to the recommended spares, furnish all of the following minimum spare parts, tools and devices. Provide spare parts and special tools in accordance with the requirements of the General Conditions.

1. General: Provide 10% (minimum of ten (10)) spare fuses, indicating lights, etc., for each size and type provided.
2. Electronic Field Instruments: Provide one (1) complete spare instrument for every ten (10), or part thereof, installed instruments (minimum of one (1)). Include any integral indicators, adapters, converters and modules needed to provide a complete functional replacement. Where similar units have been provided having different characteristics or ranges, the aforementioned quantities pertain to each type.
3. Primary Sensing Elements: One (1) spare of each size and type, complete with housing and appurtenances for each ten (10) or part thereof installed.
4. Pressure and Temperature Switches: One (1) spare of each size, type and range, complete with housing and appurtenances for each ten (10) or part thereof installed.
5. Panel Mounted Instruments: (Includes Loop Controllers, Digital Indicators, Run Time Meters, Isolators, Power Supplies etc.) Provide one (1) spare of each size, type and range, complete with housing and appurtenances for each ten (10) or part thereof installed.
6. In addition to the spares required above provide:
  - a. One (1) spare power supply for every five (5) or part thereof installed.
  - b. One (1) spare electronic module, indicator and/or circuit board for every five (5) or part thereof installed.
  - c. One (1) complete set of memory modules for each controller installed with the current program preloaded.
7. Relays, Circuit Breakers, etc.: Provide 10% (minimum of two (2)) spares of each size, type and configuration for each ten (10) or part thereof installed.

8. Panel Mounted Switches and Indicating Lights: Provide 10% (minimum of two (2)) spares of each size, type and configuration for each ten (10) or part thereof installed.
  9. Gauges, Indicators and Thermometers: One (1) spare gauge and thermometer of each size, type and range, complete with appurtenances for each ten (10) or part thereof installed.
- B. Packaging: Package spare parts in containers bearing labels clearly designating the contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory containers.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Temperature Control Equipment
  1. Johnson Controls, Inc.
  2. Siemens
- C. DDC Control Equipment
  1. Johnson Controls, Inc. - Metasys
  2. Siemens - System 600
- D. Operator Interface Terminal (OIT)
  1. Proface – Series APL3700K
- E. Control Dampers
  1. Aluminum Dampers
    - a. Ruskin - Model CD50
    - b. Air Balance - Series 500
  2. Stainless Steel Dampers
    - a. Ruskin - Model CD30VG2
    - b. American Warming - Model VC20 and 21 (Stainless Steel)



## F. Damper Operators

1. Electronic Damper Operators
  - a. Johnson Controls - Series M-100
  - b. Belimo Aircontrols

## G. Time Delay Relays

1. Agastat - Cat. No. SSC12ABA
2. ISSC - Cat. No. 1017-B-1

## H. Repeat Cycle Timers

1. Eagle Signal Controls - CA Series
2. Automatic Timing and Controls Co. - Series 342

## I. Differential Pressure Switches

1. Dwyer Instruments Inc. - Series 1900

## J. Current Switches

1. Veris Industries Inc. Hawkeye Series 708/908

## K. Thermostats

1. General Use Thermostats
  - a. Johnson Controls
  - b. Honeywell
2. Corrosion Resistant Thermostats
  - a. Indeco Catalog number C211-040

## 2.02 HVAC CONTROLS, GENERAL

- A. General: Provide temperature control systems as specified and complete in all respects. Provide control components subject to mechanical strain of metallic construction. Provide all electric and electronic control components to be UL listed.

1. Provide all wiring and conduit that conform to the requirements of Division 16 and to applicable codes.
2. Coordinate power and wiring requirements for all equipment.

- B. Provide all power wiring, control wiring and communication wiring, associated conduit, transformers and appurtenances interconnecting all equipment provided, except as specifically specified to be provided otherwise, including but not limited to the following:
1. Temperature Transmitters
  2. Damper Actuators
  3. Limit Switches
  4. HVAC Protection Devices
  5. HVAC Control Devices
  6. Temperature Control Panel mounted electrical equipment and devices
  7. Current Switches for single phase motors
  8. Operator Interface Terminals
- C. Provide all equipment, control wiring, communication wiring and associated conduit, transformers and appurtenances interconnecting the following equipment.
1. Temperature Control Panels
  2. Air Cooled Condensing Units
  3. Packaged Air Conditioning Units
  4. Heating and Ventilating Units
  5. Air Conditioning Units
  6. Fuel Fired Heaters
  7. Chimney Automation System
  8. Supply, Exhaust and Return Air Fans
  9. Provide wiring and conduit between the HVAC equipment and the TCP for alarm connections to the SCADA system.
- D. Wiring and associated conduit for the following equipment.
1. Motor control centers to HVAC equipment, but not be limited to the following:
    - a. Motors 0.5 hp and larger
    - b. Air Cooled Condensing Units
    - c. Packaged Air Conditioning Units
    - d. Heating and Ventilating Units
    - e. Air Conditioning Units
    - f. Supply, Exhaust and Return Air Fans
  2. Lighting and power panels to temperature control panels
  3. Lighting and power panels to temperature control panels for motors less than 1/2 hp with motor starters in the TCP and from the TCP to the motors.
  4. Lighting and power panels to 120 volt powered motors with local manual motor starters.

- E. Provide power equipment and control wiring terminations in the TCP and control wiring and conduit between the MCC and TCP.
- F. Power, control and communications wiring and associated conduit interconnecting certain pieces of equipment provided under Division 16.
  - 1. All wiring and conduit from the smoke detectors to the Fire Alarm Control Panel.
  - 2. All wiring and conduit from the Fire Alarm Control Panel to the Temperature Control Panel (TCP).
  - 3. All wiring and conduit from the Purge Panel to the TCP.
  - 4. All conduit and wiring from 3-phase motors current sensors to the TCP.
- G. DDC System Communication Wiring
  - 1. The communication wiring and conduit between TCP(s), and SCADA System.

#### 2.03 OPERATOR INTERFACE TERMINALS (OITs) HARDWARE

- A. General: Install the Operator Interface Terminals (OITs) as shown and as specified in NEMA 12 rated 19-inch rack mount industrial workstations. Provide each station of identical parts and components and provided with the following features and functions:
  - 1. 15" XGA TFT color flat panel
  - 2. NEMA 4x sealed front panel
  - 3. Intel Core Due 2.0 GHz processor
  - 4. 4GB RAM
  - 5. Four PCI expansion slots
  - 6. 10/100 Base T Ethernet port
  - 7. RS232 port
  - 8. RS232 or RS485 port
  - 9. Parallel port
  - 10. PS/2 keyboard and mouse port
  - 11. USB port
  - 12. DVD-RW drive
  - 13. CD-R/W drive
  - 14. Floppy drive
  - 15. 250 GB hard drive
  - 16. Microsoft Windows XP Professional

## 2.04 CONTROL DAMPERS

- A. General: Provide multiple blade control dampers of the sizes shown at locations shown and specified. Furnish control dampers of the low leakage type designed to give not more than 15 cfm leakage per square foot of a 48-inch square damper at 4-inch w.g. pressure differential when tested in accordance with AMCA 500.
- B. Construction: Provide dampers for proportional mixing of converging airstreams of the multiple parallel blade type with blades positioned to direct air into the converging branch, and dampers for throttling of the multiple opposed blade type, unless otherwise shown. Provide control damper meeting the following requirements:
1. Construct dampers (blades and frames) of the same type of material as the ductwork in which they are installed.
  2. Except where specified otherwise, provide damper blades which do not exceed 6 inches in width and 48 inches in length and are rigidly constructed. Supply blades suitable for high velocity performance. Connect multiple section dampers with epoxy coated steel jackshaft.
  3. Provide damper bearings made of non copper-bearing corrosion-resistant materials, molded synthetic or Type 316 stainless steel. Provide EPDM rubber blade seals along with the damper. Provide jamb seals of the spring type of materials specified resulting in a tight closing, low leakage damper.
- C. Stainless Steel Dampers: Construct stainless steel dampers of Type 316 stainless steel. Supply frames 5-inch wide, 14-gauge stainless steel with mounting flanges, reinforced corners and flexible stainless steel jamb seals. Supply blades of 16 gauge stainless steel with elastomer edge seals mechanically fastened. Furnish axles and linkage in the air stream of 316 stainless steel.

## 2.05 DAMPER OPERATORS

- A. Electronic Actuators: Furnish electronic damper actuators of two position or modulating type as required. Provide actuators which have electronic overload or digital rotation sensing circuitry to prevent damage throughout rotation. Provide actuators with the torque required for proper close-off and capable of being mechanically or electrically paralleled to increase torque where required. Provide a mechanical spring return mechanism for "Fail safe" operation. Non-mechanical forms of fail safe are not acceptable. Provide all spring actuators capable of both clockwise and counterclockwise operation by changing the mounting orientation. Provide proportional actuators designed to accept a 2 to 10 VDC or 4-20 mA input signal and provide an independent 2 to 10 VDC position feedback signal. Provide proportional actuators powered by 24 VAC or VDC and 2 position spring return actuators powered by 24 or 120 VAC. Power consumption not to exceed 15 VA per actuator. Provide actuators with an external manual gear release or crank to allow manual positioning when the actuator is not powered. Provide all

modulating actuators with an external direction of rotation switch and a 3-foot electrical cable.

## 2.06 SWITCHES AND RELAYS

- A. General: Provide electric switches and relays necessary to accomplish specified control functions installed in the appropriate temperature control panels. Provide switches and relays with 10 amp at 120 Vac rated contacts. Provide electric switches and relays complying with applicable requirements and ratings specified in Division 16 unless otherwise specified.
- B. Construction: Provide electric relays of the plug-in mechanical type with indicating light.
- C. Time Delay Relays: Provide adjustable time delay relays with automatic reset, with ranges as specified.
- D. Latching Relays: Provide magnetic latching dual coil relays with contact position indicator that maintains the condition during a power failure.

## 2.07 DIFFERENTIAL PRESSURE SWITCHES

- A. Differential Pressure Switches: Supply differential pressure switches for air systems. Select each differential pressure switch with a suitable operating range for the specific application. Provide differential pressure switches diaphragm operated, suitable for temperatures -30 degrees F to 180 degrees F, with 45-inch w.g. rated pressure, 10 psig maximum surge pressure and complete with adjustable differential pressure setpoint screw.
- B. Functions: Unless otherwise noted, provide each differential pressure switch to accomplish the following functions as described in Article 3.04.
  - 1. Provide an identified DDC point alarm (visual and audible) through the DDC system.

## 2.08 CURRENT SWITCHES

- A. General: Provide all single phase motor operated systems with electric current switches. Provide electric current switches to accomplish specified control functions and comply with applicable requirements specified in Division 16.
- B. Construction: Provide current switches of a solid state type with compatible current and voltage ratings. Provide switches complete with in-rush time delay, single setpoint adjustment, power and status LED's, and adjustable trip setpoint with accuracy of  $\pm 2$  percent of range. Provide switches with UL listing and NEMA 4X rating.

- C. Design: Provide switches designed for 5 to 185 degrees F and 0 to 95 percent humidity, and of a power induced type. Switches with external power supply are not acceptable.
- D. Functions: Unless otherwise noted, provide each switch to accomplish the following functions:
  - 1. De-energize the respective motor starter.
  - 2. Energize an audible alarm and an identified pilot light at the related temperature control panel, and identified DDC point alarm (visual and audible) throughout the DDC system.
- E. Provide current switches by Veris Industries, Hawkeye Series 708/908 or approved equal.

## 2.09 TEMPERATURE MEASUREMENT

### A. Temperature Transmitters

- 1. General: Mount temperature transmitters for RTD inputs in an enclosure that is wall or stand mounted adjacent to the temperature element assembly or as indicated on the contract drawings. Provide with weatherproof enclosure or intrinsically safe as appropriate for the environment. Provide transmitters to be loop powered from Temperature Control Panel or I/O panel with 24 VDC and which have an isolated current output range of 4 to 20 mA 24V DC.
- 2. RTD Input
  - a. Provide transmitters which have an accuracy of 0.2 percent of full scale, an ambient temperature coefficient better than plus or minus 0.01 percent/degree F total for factors of zero shift, span shift and suppression shift for calibration spans as low as 3.0 millivolts.
  - b. Equip room temperature transmitters with epoxy coated steel covers.
  - c. Provide duct-type transmitters with insertion probe or using capillary averaging elements in systems or ductwork with greater than 8 feet perimeter (or circumference) length.

## 2.10 THERMOSTATS

- A. Electric Thermostats: Provide electric thermostats as two-position type or fully modulating type as required. Furnish electric thermostats with bimetallic sensing elements and concealed adjustable setpoint. Supply electric thermostats with field adjustable sensitivity and with thermometers in covers of approved standard finish. Furnish electric modulating type thermostats that operate on the balanced bridge principle. Provide thermostats sensing the temperature of rooms, when located

outside of the room, of the remote bulb type with stainless steel bulb and capillary not exceeding 20 feet in length.

- B. Corrosion-Resistant Thermostats: Provide all thermostats to be electric, corrosion-resistant type in a NEMA 4X enclosure with a nickel-plated or stainless steel bulb.

## 2.11 TEMPERATURE CONTROL PANELS

- A. General: Furnish temperature control panels with suitable brackets for wall mounting or floor mounting as required by the panel size, each prewired to integral identified terminal strips. Provide interior panel wiring color coded and with numbered conductors, neatly bundled and secured. Furnish panels of the NEMA 12 enclosed type, equipped with hinged doors and locks, and constructed of heavy-gauge sheet steel or aluminum with baked enamel finish. Provide a disconnect switch mounted inside the panel for each 120-volt circuit powering the temperature control panel. Provide a power "ON" pilot light mounted on the face of the panel for each circuit feeding the panel to be energized when the electric circuit feeding the panel is energized. Number each panel and provide a nameplate identifying the system or systems controlled. Conform panels to Section 16055 - Electrical Requirements for Shop-Assembled Equipment.
- B. Provide each temperature control panel powered through its own UPS. Provide UPS under this Division of the Specifications. Provide a UPS meeting the requirements of the applicable Division 16 Specification.
- C. Panel Components: Furnish the temperature control panels with thermometers, switches, alarm annunciators and pilot lights and similar items mounted on the front of the panel. Mount DDC controllers, control relays, timing relays, reset timers, remote control stations, terminal strips and other components inside the panel. Equip the panels with starters with thermal overload for associated HVAC and plumbing equipment motors 1/3 hp and smaller. Provide identified pilot lights for each motor. Provide red RUN indication pilot light and green OFF indication pilot light. Provide motor starter meeting the requirements of Division 16. Provide an Operator Interface Terminal (OIT) for DDC monitoring and control specified in paragraph 2.03.A.
- D. Alarm Annunciator: Provide the alarm annunciator as solid-state suitable for flush panel mounting or mounting adjacent to the temperature control panel. Provide the annunciator window engraved with black lettering and illuminated blue for ALARM. Provide a panel-mounted lamp test push button such that when pressed all alarm lights are illuminated.
  - 1. Alarm Module Function: Provide the alarm module such that when an alarm occurs, the alarm module causes a horn to sound and the corresponding alarm light to flash. Provide a panel-mounted SILENCE push button to silence the horn and change the flashing light to a steady light when pressed. Provide the alarm module such that another alarm occurring in the system repeats the above sequence. When the alarm condition returns to normal, the

alarm module automatically causes the corresponding steady alarm light to turn off. Provide each annunciator module with a lock/nonlock feature.

2. Auxiliary Contacts: Include in each alarm module auxiliary isolated dry contacts which repeat the field contact function. Provide alarm circuits as double pole, prewired to a terminal strip for remote signaling. Provide, in addition, the annunciator with an auxiliary contact which closes upon loss of power to the annunciator.
  3. Alarm Horn: Furnish the annunciator with a variable volume alarm horn powered by 115-volt ac, 60 hertz, and suitable for panel mounting.
- E. Identification: Identify devices mounted on the front of the panel by engraved bakelite or formica tags. Identify all equipment as scheduled and as shown on the control diagram. Mount the tags using stainless steel screws. Mounting tape and glue are not acceptable. Permanently mount the control diagrams provided under suitable protective cover adjacent to the local control panel.
- F. Electrical Diagrams: Consult the schematic diagrams shown for control relays, timing relays and other accessory equipment to be provided, and mounted and prewired to terminal strips in the temperature control panels. Provide control relays, timing relays, reset timers, manual motor starters and remote control stations meeting applicable requirements of Division 16.

## 2.12 DDC SENSORS AND TRANSMITTERS

- A. Temperature Sensors: Provide platinum resistance temperature detector (RTD) elements to measure all temperatures. Thermocouples are not acceptable.
- B. Outdoor Air Sensors: Provide outdoor air sensors protected from direct sunlight, building thermal effects and aspirated properly.

## 2.13 DDC SYSTEM - GENERAL REQUIREMENTS

- A. General: Furnish the DDC System Operator's Console as a computer-based system of modular design consisting of a central operator console, including central processing unit, display unit, keyboard, and hard copy printer interconnected with DDC temperature control panels by a multiplexed communications network. Provide the basic elements of the DDC structure built up of only standard components kept in inventory by the DDC supplier. Provide DDC controls meeting the following requirements:
1. Provide Direct Digital Controls as shown on the Contract Drawings and as specified herein. Provide DDCs with all necessary components to accomplish these requirements. Provide an Operator Interface Terminal (OIT) with keypad to facilitate monitoring of points, changes of setpoints, etc. mounted on the face of each Temperature Control Panel with DDC.



2. Configure the DDCs to perform functions shown and specified. Coordinate and obtain from all equipment suppliers DDC systems of the same manufacturer and series.
3. Functions to be performed by the DDCs include but are not necessarily limited to the following:
  - a. Alarm and status indication
  - b. PID control and arithmetic functions
  - c. Interlock and sequential logic control of processes and equipment operations
  - d. Collection and transmission of data and control parameters to and from other DDCs
  - e. Provide a dry contact rated 2 amperes at 120 volts ac for remote indication of DDC failure. Wire all such alarm contacts from each DDC in parallel and indicate status locally with an indicator light.
4. Provide the DDCs of the electronic type furnished with all necessary relays (binary outputs), timers, counters, and latches as data manipulative functions and arranged into the format required to accomplish the functions shown and specified.
5. Design and construct the DDCs for the demanding requirements of real-time process management and control.
6. Provide each panel with at least 25-percent spare of each type of supplied I/O point such that expansion need only consist of connections, field wiring and controller programming.
7. The DDC configuration to be capable of being remotely (off-line) and locally (on-line) monitored, programmed, modified and displayed by use of a personal computer and documentation software which must be provided as part of this contract.
8. Provide the capability to enter and display DDC logic on the OIT.
9. Provide any process control description which cannot be addressed by a standard DDC firmware module with a custom program written by the manufacturer.
10. Arrange each Temperature Control Panel, in modular type design. Provide all DDC units to be easily removed for ease in replacement or restructuring the hardware arrangement.

11. In the event of a power failure or malfunction of the logic hardware, the controller shall provide dry, Form C contact closures for remote and local indication and alarming.
  12. Include a self-diagnostics package to determine proper processor operation. Provide an LED in clear view on the front of the panel connected to indicate improper processor operation..
  13. Provide the system such that changing an on-line control logic process operation does not necessitate the halting of other DDC processors.
  14. Provide optical isolation for all inputs and outputs for controller logic protection.
- B. Provide any card, any slot, plug-in packaging, with locking bars/ or screws to hold I/O modules in place
- C. Provide 300 Volt, screw type, field wiring terminal strips sized to accommodate a minimum of two #14 AWG wires per terminal. Terminate all field wiring on the field wiring terminal strips. Do not run field wiring directly to any panel internal devices.
- D. Provide individually fused output circuits for all discrete output modules. Provide fuses capable of being inspected without removal of and replaced without disassembly of the DDC module.
- E. Provide all outputs for contactors and relays rated for a minimum of 2.0 amps continuous at 120 Vac. Provide higher rated outputs and/or interposing relays inside the temperature control panel in order to assure that ratings of the output contacts are not exceeded. Coordinate with equipment being controlled by the respective outputs.
- F. For outputs to motor contactors and other equipment type load relays, provide transient and inrush surge suppressor connected across the output contact terminal and the neutral-common terminal inside the control center to suppress the switching surge transient to lower than the continuous rating of the output contacts.
- G. Provide the following types of I/O circuits for use with the supplied DDC System:
1. Analog Inputs (12 bits minimum)
    - a. 0-10 VDC
    - b. 1-5 VDC
    - c. 4-20 mAdc (250 ohms maximum impedance)
    - d. Millivolt signals
    - e. RTD signals

2. Analog Outputs (12 bits minimum)
  - a. 4-20 mA<sub>dc</sub> (load of 750 ohms minimum)
  - b. 0-10 VDC
  - c. 1-5 VDC
3. Register Inputs and Outputs (16 bit)
  - a. Single BCD
  - b. Multiplexed BCD
4. Discrete Inputs
  - a. 5 V, 12 V, 24 V, 48 V and 120 VAC/dc in both isolated and common circuit types
  - b. TTL Logic
5. Discrete Outputs
  - a. 120 VAC in both isolated and common circuit types
  - b. 12-120 VDC
  - c. Form C Relay Contacts
  - d. TTL Logic
6. High Speed Encoder/Counter
  - a. Accept and count pulse inputs independently and unaffected by I/O scan or program scan
  - b. Minimum pulse rate of 50 KHZ
7. DDC communication system
  - a. Network DDC cards with each other via a proprietary peer to peer dedicated serial communication system. The serial communication system to operate at a minimum of 1Megabaud.
8. Arrange signal and control circuitry to individual DDC boards such that board failure must not disable more than one half of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.). Where possible, assign individual control loops and equipment to individual boards such that failure of the board will disable only one loop or piece of equipment.

**H. Required Features**

1. Construction: Modular printed circuit boards
  2. Type: Electronic components with integral processing unit and firmware reprogramming capabilities
  3. Memory: Provide DDC memory which has sufficient capacity for default firmware and additional RAM as required for any custom firmware utilized on the particular board. DDC board configuration to be stored in Non-volatile type (EEPROM) or Lithium battery-backed RAM with minimum retention time of 2 years under worst case conditions. Provide DDC UPS as previously specified.
  4. Language Format: Standard and custom firmware blocks
  5. Provide type and quantity of I/O as required to perform the operational and functional requirements plus 20 percent spare (minimum of one module) for each type of I/O module used. Mount and wire spare points ready for use and to require only field wiring connections and software configuration to place the point in service.
  6. Internal Functions: Provide relays, timers, counters, latches, internal storage registers, and other functions as required to perform specified functional requirements plus 20 percent spare capacity.
  7. Security Features: Provide security password protection through system programmer terminal to prevent tampering of logic sequences and unauthorized programming.
  8. Processor Scan Time: 2 ms per 1 K bytes of memory typical.
  9. Operating Temperature: 32°F to 140°F.
  10. Storage Temperature: Minus 40° F to 160°F.
  11. Power Supply: 120 VAC, 10 percent with fuse or circuit breaker protection. Size supplies for a minimum of 130 percent of maximum simultaneous current draw.
  12. Clock: Battery-backed clock with typical variation of 20 sec. per month.
  13. Programming/Documentation Software:
- I. Provide DDC programming/documentation software package compatible with the latest version of Microsoft Windows Operating System which is fully menu-driven

and self-prompting. Package to provide fully integrated programming and documentation.

- J. Package System: Provide the DDC system herein specified fully integrated and installed as a complete operating package conforming to applicable requirements of Division 16. Provide the DDC system with all computer software and hardware, operator input/output devices, remote processing units, sensors and controls, relays, switches, wiring and piping. Provide DDC manufacturer responsibility for preparing wiring diagrams, final installation and final connections. Provide a DDC panel, output display, and operator entry device (OIT) at each TCP location.
- K. DDC Supplier: DDC supplier to provide the engineering, installation supervision and labor, calibration, software programming, and checkout necessary for a complete and fully operational DDC system as specified. Provide all adjustments and calibrations.

## 2.14 DDC SYSTEM - OPERATION

- A. Input/Output Capabilities: Supply the control operator console with capabilities through the keyboard and CRT to:
  - 1. Request displays for any point or group of points, such as, but not limited to, all fan statuses, all mixed air temperatures, all discharge temperatures for any individual system.
  - 2. Issue start, stop and similar commands to equipment.
  - 3. Initiate and cancel all point logs, trend logs, alarm summaries and reports.
  - 4. Add, delete, or change points within a system, building, or in and out of all application programs.
  - 5. Communicate in full English language. Provide identifiers having 80 characters of description which are operator entered.
  - 6. Display time and date.
- B. Programming Capabilities: Provide operator programming capabilities to do additions to the system without going back to the manufacturer's software programmers. Provide the capability of doing all changes, while the system is on-line and operational. Provide operator programming capabilities which include, but are not limited to, the following:
  - 1. Add and delete all types of points.
  - 2. Modify any point parameter or engineering units.
  - 3. Change, add, or delete English language descriptors.
  - 4. Change, add, or delete points in start/stop programs, trend logs.

5. Select analog alarm limits.
  6. Add, modify or delete any display.
- C. Fail Safe Operation: Design the system to automatically restart after a power failure or upon initialization of the system controlled loads which have a user programmable delay between successive starts to limit demand peaks.
1. Provide a dedicated fail-safe relay in the DDC panels controller to change state on a hardware and/or software fault. Use the relay contacts to set a fixed fail-safe position for designated output controlled devices.
  2. Store the TCP/DDC panels' software and system data on disk memory. Supply the OIT to up-line load any entered attribute changes made at the panel by a manual command. Provide for all system functions to stay on-line during such loading.
  3. Provide each DDC panel comprised of self-diagnostics that continuously monitor the proper operation of the unit, such that malfunction of the controller, any distributed control module, or associated communication link are reported automatically to display the condition of failure along with time and date. Provide service message buffer in each DDC panel to store at least the last 20 service alarms with their time/date of occurrence and the time/date of their acknowledgment. Arrange the system to permit on-line interrogation via a telephone modem from a remote location for service inquiries.
- D. Control Programs: Provide each DDC panel with control functions integrated and executed within the panel.
1. Provide Control functions for two and three-position start/stop, event scheduling, direct digital control of analog control loops and safety interlocks which utilize preprogrammed software.
  2. Utilize a self-prompting, fill-in-the-blanks programming methodology for user reconfiguration of the system.
  3. Provide program elements accessible for review or modification through direct keyboard inquiry, and also accessible for review or modification by use of single keystroke to sequentially select each application program and subsequently step forward or backward through each application program element by single keystroke.
  4. Apply direct digital control to all analog control loops for proportional, integral and derivative control strategies. Design the system to implement, modify or remove these algorithm strategies while the system is on-line and operating. Provide each control loop to be user definable for sensor and

actuator field devices, software reset schedules, setpoint, PID constants, dead band region, and output high-low limits.

5. Provide time of day scheduling for 32-event schedules for equipment start/stop and setpoint operation. Provide each schedule containing 6 events per day for each of 7-calendar week days plus two unique holidays and one temporary schedule day. Provide schedules to be on-line modifiable. Each controlled point may have its own unique schedule or be assigned to a common schedule for use in making general schedule changes.
  6. Provide the time scheduling program to operate in accordance with a yearly calendar that automatically adjusts for daylight savings time and leap year.
  7. Provide holiday schedule for 32-user programmed holiday periods which may be defined one year in advance, with each period design to provide for up to 99 consecutive days and be assignable in the event schedules as either one of two holiday types or as a temporary day schedule.
  8. Supply maintenance scheduling that monitors equipment run time and generates a maintenance message after a pre-established time has elapsed, where 32-character user definable message is displayed or printed automatically at any one of three preset run time values. Provide each run time limit to be programmable from 0 to 65,000 hours. Provide separate and distinct messages associated with each run time interval capable of being displayed selectively on any DDC panel in the system.
  9. Design the system such that control priorities manage the programmed control strategies for any start/stop function so that at any point in time, the highest priority control function is implemented. Allow safety event sequences and manual commands to override lower level functions, such as duty cycling or time scheduling. Provide minimum of 16 priority levels for each start/stop point. Provide the system such that the system operator be able to query the current priority level function that has control of the start/stop point at either a local DDC panel, remote terminal, or operator's console.
- E. Alarm Processing: Supply the OIT with the following alarm processing features:
1. Program the OIT such that each change of state causes an alarm message, including the time of receipt of the alarm report, system and point descriptor and alarm condition.
  2. Display, at a minimum, the previous 24 hours of alarms.
  3. Sound an audible alarm which can be silenced by manual alarm acknowledgment on receipt of New contact or analog alarm printouts.

4. Provide an automatic time delay of alarms during equipment start-up or shutdown to prevent nuisance and false alarms.
  5. Annunciate failure of field cabinets or communication lines to it.
  6. Display of maintenance messages upon alarms.
- F. Software Capabilities: Include in the resident software tabular and graphical data screens for each system and groups of systems served. Provide graphics displays with the capability of displaying setpoints, analog values, statuses and alarms directly upon the appropriate equipment graphic. Provide maximum graphic analog data update time of 4 seconds. Provide software that, upon restoration of power after a power failure, automatically reloads all required software.
- G. Control Loops: Provide all control loops with PID capability. Provide on-line automatic tuning PID control loops using actual input and output data history. Provide graphic depiction of input and output during tuning operation.

## 2.15 OPERATOR'S CONSOLES

### A. Furnish and install an engineering workstation as follows:

1. CPU >2600 MHZ Intel Pentium (latest generation) (Gateway, Dell, Compaq, or approved equal) with additional internal cooling fans
2. Ram Memory 1024 Megabytes (Minimum)
3. Cache Memory 512 K (Minimum)
4. Floppy Drives 1 - 1.44 MEG 3.5 Inch
5. Hard Drive 1 - 120 GB
6. CD Rom Read and Write CD-RW drive
7. Video 128 MEG RAM Memory
8. Color Monitor 20 Inch Flat Panel, 19.3 inch viewable LCD
9. Modem 56K Baud with fax send/receive software
10. Network Card 10/100 MBps Ethernet, 3-COM 3C905 or approved equal (for access to network printer)
11. Input Devices 124 Key Keyboard  
Track Ball or Mouse  
Membrane Keyboard (for Operating)



12. Operating System      Latest Version of Microsoft Windows Operating System
  13. Log and Report Printers      Provide a latest version of the laser printer, 8-1/2" x 11" format. Hewlett Packard Lasterjet 4100 Series or approved equal. Include JetDirect print server ethernet card.
- B. Power the workstation console from its own UPS.
- C. Provide one (1) notebook portable computer with modem for off site system monitoring by facilities engineers with the following features:
1. Intel Pentium (latest generation) Micro Processor - fastest speed available at time of bid
  2. 512 Megabytes RAM Minimum
  3. 1.44 MB 3.5" Drive
  4. 60 MB Minimum Hard Drive
  5. Active Color Matrix SVGA LCD display with external monitor connector 1280 x 1024
  6. 1 Parallel Port
  7. 1 Serial Port
  8. USB Ports
  9. Mouse
  10. Data Acquisition Remote Access Software Package
  11. 56K Modem with fax send and receive software
  12. Latest Version of Microsoft Windows Operating System
  13. With spare battery and battery charge kit
- D. DDC Software
1. Furnish, install, program, test and place in satisfactory operation on the workstation above, a supervisory control and data acquisition (DDC) software system as follows.

2. Provide software packages to permit workstation to operate in real time and continue monitoring while simultaneously permitting unlimited off line development of control strategies, graphic displays, alarms and reports on a remote workstation.
3. The failure or shutdown of the workstation shall not inhibit the operation of any control system or function. While the purpose of this system is monitoring and data acquisition, provide software that has the ability to perform basic control functions.
4. Generate reports by both operator action and automatically by date and time. Provide the report for viewing on the display and printing. Display or print alarms continuously with operator keyboard enabling of alarm points and selection of destination.
5. Provide DDC Software based on the latest version of Microsoft Windows Operating System and provided with all necessary drivers, modules, protection devices, licenses and unlimited telephone support from the manufacturer. Operating system must be real time pre-emptive multitasking.
6. Provide software packages from a single supplier as provided by Iconics "Genesis", FIXX DMACS Wonderware software development "Wonderware" or approved equal.

E. DDC System Programming

1. Provide programming, testing and startup services by the supplier to customize the DDC software packages to the specific requirements of this project and as required for proper operation and as detailed below.
2. The system monitoring workstation to present all information in graphic and tabular form. Provide graphic displays showing a general plant overview, with one screen showing status of the heating systems. In addition, provide detailed graphic screens for each heating loop, and air handling and other fan systems system, showing all temperatures, pressures, flows, levels, speeds, and equipment status on a background of general equipment and piping layout based on the Contract Documents. Selection of any screen including graphics, alarms, reports and status to be by two keystrokes and/or point and click with the trackball (or mouse). All equipment pertaining to the HVAC, plumbing and fire protection systems shall be monitored by this system.
3. Include a "Main Menu" screen on which appear the keystrokes necessary to access any and all system screens and functions.

**F. Alarms**

1. Provide the system with current and historical alarm screens with date and time stamping. Alarms to be acknowledged from the TCPs or from the workstation. Provide system such that operator acknowledgment of alarms and return to normal status can also be printed and indicated on the alarm pages with time and date stamp. Provide system such that it is possible to acknowledge and clear alarms from the current alarm table. Ensure the system is able to store historical alarm data for a minimum of 30 days before being saved to disk.
2. Provide system such that current alarms are entered in an alarm log file with a description, their priority and a time and date stamp. While an alarm condition exists, the graphic symbol for the device shall indicate the condition on the screen with a flashing red or yellow symbol. In addition, operator response to alarms and return to normal status of all alarm points shall be recorded in the log file. Provide for printing the log file.
3. Submit the proposed messages and/or names generated by the alarms to the Engineer for review.
4. Combination of several pieces of information may be necessary to generate some alarms. Perform this logic in the TCPs using ladder logic. Alarm points to include but not be limited to: failure of any piece of equipment to start on command (after a delay), motor trip, and temperature deviation beyond preset limits and analog loop failure, as well as malfunction alarms generated in control logic and hardware.

G. Event Log: In addition to the alarm tables, provide an event log capable of recording and storing on hard drive, sequences of events over a one week period for later printout and/or storage to floppy disk. These events to include starting and stopping of fans and auxiliary equipment. The log to record failures and startup of backup and standby equipment. All events to be date and time stamped for future reference. Provide the system such that the operator does not have the option of disabling the event log feature from the keyboard.

H. Analog Trending: Provide trend graphs for all analog data for the previous one hour, 24 hour and 30 day period. Selection of from one to eight analog points to be selectable by the operator for display and/or printing on a trend graph. Analog data to be permanently stored in spread sheet format (Lotus or Excel) for later retrieval on disk and/or printer. Data also to be printable in graph format.

I. Help Screen: In addition to the above mentioned screens provide help screens available from any point in the system showing the operator how to move from area to area and describing what symbols and icons indicate.

## J. Graphic Displays

1. Display equipment status graphically with the use of colors, blinking and inverse video. The equipment symbol to be green when off and ready, red when running, flashing red or yellow on malfunction or alarm and grey when not ready. Valve symbols to be green when not fully open and red when open. Flow switches to be green to indicate no flow and red to indicate flow.
2. Display all analog values numerically on the graphic screen in one decimal point engineering units in their relative position in the system. Analog data displays to agree with data on transmitters and/or controllers within one digit. When analog values go above or below operator selectable setpoints the value to appear in a red background. When values go out of range or signal is lost, the data field to change to a flashing red background. Default alarm values to be 10% and 90% of range.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. General: Verify that systems are ready to receive control component Work.

### 3.02 INSTALLATION

- A. General: Install required control components in accordance with the manufacturer's recommendations and approved shop drawings. Adjust and test to meet the required control performance. Prior to control installation, coordinate the proposed controls with electrical plans and interfacing equipment for compatibility. Install the systems by experienced competent mechanics employed by a firm with an established controls service organization.
- B. Configure DDC components to prevent erroneous and nuisance alarms by using techniques including time delays and logic.
- C. Configure operator interface unit using function keys and instructional prompts so that operators can modify setpoints and presets without any special training or knowledge of the programming.
- D. For open/close dampers, after a time delay sufficient to permit the damper to operate fully, compare the DDC output with the associated limit switch. If the output calls for an open damper, the open limit switch should be made and the closed switch should not and vice versa. Any combination other than these two to cause an alarm.
- E. Program the DDC system to monitor limit switch positions for dampers in transition.

- F. Display dampers in transition (between open and close position) on the OIT with message "In Transition". Submit limit switch development for all dampers on 100 percent outdoor air units and exhaust fans with motorized dampers.
- G. Electrical Requirements: Provide electrical material and installation in accordance with applicable requirements of Division 16.
- H. Setpoints: Provide adjustable setpoints for all setpoints listed in the specified or scheduled control sequences.
  - 1. Temperatures shall be shown in degrees F.
- I. Fan Failure: Prove operation of all 120-volt supply, exhaust and return air fans by current switches. Prove operation of all 3-phase supply, exhaust and return air fans utilizing the current switches provided by electrical in the motor starters and wired to the TCP by electrical. If a fan has been commanded on and the current switch indicates a no-flow status, initiate an individual identified audible and visual alarm and DDC alarm and close remote alarm contacts at the temperature control panel annunciator for the fan in alarm. Provide an adjustable time delay function for each current switch to lock out the alarm during fan start-up.
- J. Control Devices: Provide a HAND/OFF/AUTO (HOA) selector switch for each supply, exhaust and return air fan at the temperature control panel and Hand Control (HC) for each mixed air damper control.
- K. Test Button: Provide an OFF/LOCK-ENABLE switch with a momentary contact TEST push button at each fan. Provide and wire the TEST push button to bypass the fan's safety devices regardless of the HOA switch position.
- L. Signals: Provide signals as follows:
  - 1. All electronic instruments transmitters to provide a linear 4 to 20 milliamp signal at a nominal 24VDC. Provide the signal proportional to the process variable indicated. Signal conditioning such as square root extraction or frequency conversion, if needed, is to be done by the transmitter electronics.
- M. Painting: Provide painting in accordance with Section 09911 - Exterior Painting and Section 09912 - Interior Painting.
- N. Control Sensors: Check and verify locations of thermostats, and other exposed control sensors with plans and room details before installation. Locate room thermostats 48 inches above floor. Align with lighting switches.
  - 1. Mount outdoor thermostats and outdoor sensors indoors, with sensing elements outdoors protected by a sun shield.

2. Provide thermostats in aspirating boxes in front entrances, and where indicated.
  3. Provide guards on thermostats in entrance hallways and other public areas and where indicated.
- O. Smoke Detectors and Dampers: Provide smoke detectors and smoke dampers installed in accordance with NFPA 90A.
- P. Thermometers: Locate a thermometer adjacent to each thermostat or DDC sensor. Mount a dial thermometer, minimum 2-1/2-inch diameter, with a liquid-filled remote system adjacent to each remote bulb thermostat, remote sensor and DDC sensor. Supply averaging bulb thermometers where averaging bulb thermostats and sensors are required. Provide duct-type thermometers in all fresh air intakes, mixed air and return air main ducts, and all supply fan discharges. Furnish thermometers with proper range scales for the locations where they are installed.
- Q. Control Dampers: Provide mixing dampers of opposed or parallel blade construction arranged to mix streams.
- R. Damper Operators: Provide pilot positioners on damper operators sequenced with other controls. Locate damper operators outside of the airstream wherever possible.
- S. Temperature Control Panels: Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports.
- T. Conduit and Wiring: Provide conduit and electrical wiring where required meeting requirements of Division 16.
- U. Lights, Switches, and Push Buttons: Provide pilot lights, selector switches, and push buttons located on face of control panels to be heavy duty oil tight in accordance with Section 16491 - Control Components and Devices.
- V. Panel Wiring: Provide panel wiring powered from sources outside the panel a different color from panel wiring powered from sources inside the panel. Provide a sign on the front of the panel indicating multiple sources of power and color of the wire for sources outside the panel.
- W. Current Switch
1. Where equipment is powered from a combination starter, mount the sensor in the starter. Where equipment is powered from the TCP, mount the sensor in the TCP. For two speed, two winding motor powered equipment, provide a current switch for each speed. Provide relay or software logic, as appropriate, to determine whether or not the equipment is operating at the proper speed.

If the equipment is not operating at the proper speed, generate an alarm in the DDC system and displayed on the OIT.

2. Adjust the current switch to provide a closed contact only when the motorized equipment is operating properly. Adjust the switch to provide an open contact when proper air flow is not achieved due to a broken belt, closed damper, or any other reason.
3. Provide software programming to provide an alarm at the OIT and operator console when the equipment is called to operate and after an adjustable time delay, the current switch does not provide a closed contact.

X. Coordinate for the location of duct type smoke detectors.

### 3.03 GENERAL SEQUENCES OF OPERATION AND CONTROL REQUIREMENTS

#### A. DDC Point Numbering System

1. DDC points have the following general form: A-BBB-XX-CCCC-DDD, where
  - a. A is the Building Letter designation in which, or nearest which the point is contained
  - b. BBB is the identification (typically from equipment schedules) of the equipment or system monitored or controlled
  - c. XX is the numerical sequence number of the equipment/system (e.g., EAF4)
  - d. CCCC is the abbreviation of the type of monitoring and control. The abbreviations are listed at the end of the DDC Points lists contained at the end of this Specification Section
  - e. DDD is used when multiple points need to be uniquely identified.
2. Use the DDC Point Numbering System in DDC point lists contained in Control Submittals. Include in the Control Submittals the points contained in this Specification and modified general points contained in some sequences of operation.

#### B. Electrical and Equipment Ratings

1. Review ALL documents for required electrical ratings
2. The more stringent ratings apply (e.g., minimum rating for all panels and equipment is NEMA 12.)

- C. Include in Control Submittals containing Sequences of Operation, all DDC points listed and all DDC points implied by Specification Sequences of Operation.
- D. Provide temperature, static pressure, etc., setpoints and alarm points that are easily and clearly adjustable from OIT.
- E. Provide all Analog points with high and low alarm limits and include these limits in Control Submittals.
- F. All temperatures listed are in degrees F.
- G. Mount control devices on the panel front as follows:
  - 1. Group together the control devices for each area served.
  - 2. Provide greater spacing between the groups of control devices than the spacing between control devices in a group so that the grouping by area served is obvious.
- H. Hand/Off/Auto (HOA) Switches
  - 1. Provide panel face HOA switches or switch designations to match the control requirements at the appropriate TCP for all HVAC motors. Clearly and permanently identify the system served by the switch.
  - 2. HOA switch for each fan with an associated two position damper for 100 percent outside air units with motor operated dampers:
    - a. In the HAND position open the damper associated with the fan and when proved open by the damper end switch run the fan. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.
    - b. In the OFF position the fan will not operate. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.
    - c. In the AUTO position the fan will operate based on the control strategies that follow unless shutdown by the FACP or overridden by the PSP.
  - 3. HOA switch for each fan with an associated motor operated modulating damper:
    - a. In the HAND position the fan runs. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.



- b. In the OFF position the fan will not operate. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.
    - c. In the AUTO position the fan will operate based on the individual equipment control strategies that follow unless shutdown by the FACP or over ridden by the PSP.
  - 4. HOA switch for all equipment except for the fans indicated above:
    - a. In the HAND position the unit runs. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.
    - b. In the OFF position the unit will not operate. Provide an alarm to the DDC system and displayed on the OIT indicating the HOA switch is not in the AUTO position.
    - c. In the AUTO position the unit will operate based on the control strategies that follow.
- I. Hand Control (HC)
  - 1. Provide panel face HC to match the control requirements at the appropriate TCP for all mixed air damper controls.
  - 2. Clearly and permanently identify the system served by the control.
  - 3. Provide the control with the capability to set the outside air damper, return air damper and exhaust air damper for minimum outside air damper positions from 0 –100% outside air.
- J. Manual Control of Dampers
  - 1. Provide a manual means of damper operation for use during commissioning of HVAC systems and in the event of DDC failure.
  - 2. Provide override of dampers, either at the actuator or in the associated TCP
- K. DDC Alarms
  - 1. Provide all DDC points with programmable alarms and alarm messages.
  - 2. Provide any alarm capable of being easily assigned visual or visual and audible annunciation. Initially, provide all alarms with visual and audible alarm annunciation.

3. Provide a minimum message for each DDC point alarm that includes
  - a. The point ID number
  - b. The English point name
  - c. The type of alarm (refer to Points List for alarm types)

L. Air Flow Status

1. Airflow status is provided by current switches located in the TCP for 120-volt motors and in the MCC for 3-phase motor.
  - a. Coordinate with the test and balance work performed in Section 15950 – Testing, Adjusting and Balancing to properly set the upper and lower operating current ranges of normal operation.
  - b. Use the work performed in Item “a” to determine improper airflow settings.

M. The HVAC equipment and Chimney Automation System local control panels shall communicate to the HVAC DDC system via one of the following:

1. Mutually compatible digital communication links.
2. Fully configured gateway.
3. Dedicated interface panel.

N. Division 15 is responsible for the coordination of all control connections.

O. Sequence of Operation Controls Submittal Requirements

1. Organize the submitted in the following order:
  - a. By Building ID letter and Name
  - b. By TCP ID number
  - c. By system
2. Indicate whether the system is DDC or conventional controls
3. Submit specific sequences for all equipment.
4. Include DDC point identification numbers applicable to sequence features as described in A. above.
5. Include summary of system type at start of each individual sequence, e.g., 2 speed- 100% Outdoor Air, etc.

P. Fan Interlocks

1. Include interlock schedules with control submittals organized separately for the Building, TCP and System Sequences of Operation with which they are associated.
2. Where a unit is shown interlocked to a space temperature sensor, indicate the sensor ID Number in Control Submittals. Units controlled by space sensors typically require a make up (outdoor) air damper or dampers to open. Also indicate in the damper ID Numbers in Control Submittals
3. Interlock starting of 100 percent outdoor air HVUs, RTUs and ACUs to their outdoor air damper position limit switch.
4. Interlock starting of exhaust air fans with two position motorized exhaust air dampers to the damper end position limit switches.

Q. Fan Hard Wired Control Logic

1. The local stop/Lock shall stop fan at all times.
2. Normal fan operation may be inhibited by the Fire Alarm Control Panel and overridden by the Purge Station Panel as described in succeeding sections.
3. Provide an isolated relay to signal the MCC to "Run" the fan. Provide isolated contacts in the MCC connected to the TCP for motor "RUN" and "OFF" status.
4. Provide each fan with a Hand Off Auto (HOA) selector switch mounted on the TCP. In the Hand position, the fan shall operate as described herein. In the Off position the fan shall stop. In the Auto position, the fan shall operate as described herein when directed by the DDC system's isolated dry "run" contact.
5. To operate three phase fans, the following logic shall be executed:
  - a. Open outside air damper fully for 100 percent outside air units.
  - b. Open exhaust air damper fully for exhaust fans with motor operated dampers.
  - c. When all associated dampers are proved in the proper position, send the run signal to the MCC.

6. Provide the following signals to the DDC system for three phase fans:
  - a. "O/L" failure signal from MCC
  - b. "Auto" from HOA
  - c. "Running" signal from motor starter
  - d. "Off" signal from motor starter
7. Provide the following signals to the DDC system for single phase fans:
  - a. "Running" signal from motor starter
8. Accept the "RUN" signal from the DDC system.

R. Fire Alarm Control Panel (FACP) Hard Wired Control

1. FSD-INTAKE-ACU-01-ACU-030ACU-02-HVU-01: The Fire Alarm Control Panel (FACP) shall provide a contact closure signal at the TCP. Interlock such that all of the associated fans (ACU-01, ACU-02, ACU-03, and HVU-01) will stop regardless of whether the fans are running in HAND or AUTO mode
  - a. Upon receipt of contact closure from the FACP, the following hard-wired logic shall be executed:
    - (1) Provide a latching relay with reset push button (PB) and FACP indicator light on the front of the TCP indicating FACP FAN SHUTDOWN. Wire a dry contact from the latching relay as a Digital Input (DI) signal to the DDC system.
    - (2) Unless overridden by the Purge Station Panel (PSP), upon receipt of the contact closure signal, remove fan "Run" contact and perform the following:
      - (a) Close outside air damper through relay logic if applicable.
      - (b) Close all combination fire and smoke dampers (FSDs) associated with fans. Associated FSD identification tags on drawings include the fan system identification of the fans with which the FSDs are associated.
      - (c) When the FACP contact closure is removed at the FACP and manually reset at the TCP, the TCP will resume control of fans unless other interlocks prevent operation and open FSDs.
2. FSD-INTAKE-01-A: FACP shall provide a contact closure signal at the TCP upon FSD-INTAKE-01-A's associated duct smoke detector activation.

The TCP shall be hard-wired to close the FSD upon receipt of the contact closure from FACP at the TCP.

3. FSD Control - General: FACP shall provide a contact closure signal at the TCP for fan shut down when smoke is sensed at associated duct smoke detector. Interlock such that the fan will stop regardless of whether the fan is running in HAND or AUTO mode.
  - a. Upon receipt of contact closure from the FACP, the following hard-wired logic shall be executed:
    - (1) Provide a latching relay with reset push button (PB) and FACP indicator light on the front of the TCP indicating FACP FAN SHUTDOWN. Wire a dry contact from the latching relay as a Digital Input (DI) signal to the DDC system.
    - (2) Unless overridden by the Purge Station Panel (PSP), upon receipt of the "Stop" signal remove "Run" contact and perform the following:
      - (a) Close outside air damper through relay logic if applicable.
      - (b) Close all FSDs associated with fan. Associated FSD identification tags on drawings include the fan system identification of the fan with which the FSDs are associated.
      - (c) When the FACP contact closure is removed at the FACP and manually reset at the TCP, the TCP will resume fan control unless other interlocks prevent operation and open FSDs.

S. Purge Station Panel (PSP) Hard Wired Control

1. The Purge Station Panel (PSP) shall provide an individual "Run" dry contact closure for each fan at the TCP and accept a 120 volt signal from each fan to illuminate a pilot light on its panel face to indicate that the fan is running. Provide under the Electrical Contract the PSP and wiring between it and the TCP.
2. Upon receipt of a "Run" dry contact closure from the PSP, the following hard wired logic shall be executed:
  - a. Provide an auxiliary relay and use a dry contact as a Digital Input (DI) signal to the DDC system.

- b. Operate the fan as described under section "Fan Hard Wired Control Logic".
- c. When any mixed air HVU, RTU or ACU is commanded on by the PSP, relay logic shall cause the normal damper control strategies to be overridden. Upon receiving this signal, mixed air HVUs, RTUs and ACUs shall operate with outdoor and exhaust air dampers open: return air dampers closed. After the PSP signal is removed, dampers shall revert to automatic control by the TCP.
- d. Open combination fire and smoke dampers fully at the 2-Hr and above fire rated walls.
- e. When operating from PSP override, send 120-volt signal to Purge Station Panel to energize the fan's associated "Running" light at the Purge Station Panel. The 120-volt signal to be generated only when the fan is running in "Purge" mode.
- f. When the PSP "Run" signal is cleared, the fan will resume TCP control unless other interlocks prevent operation.

T. Single Phase Motor Control

- 1. All single phase fan motor controls and motor starters are located in the TCP associated with the motors and are provided and installed under this contract.
- 2. To operate single phase fans, the following logic shall be executed:
  - a. Send 120-volt power from contactor in TCP.

3.04 SEQUENCES OF OPERATION

- A. Damper Control Positions: (1) Normal positions of control dampers must be the position the dampers return to on power failure or when its associated fan is not operating. (2) Operating positions of control dampers are the minimum outside air positions for ventilation requirements when its associated fan is operating. Refer to equipment schedules for minimum outside air requirements. Dampers can also modulate if required by the temperature control strategy. Include all interlocks and safeties.
  - 1. Provide Normal positions as follows:
    - a. Outside air damper (F-BBB-XX-D1): Closed
    - b. Return air damper (F-BBB-XX-D2): Open
    - c. Exhaust fan damper (F-BBB-XX-D3): Closed

2. Provide Mixed Air Operating positions as follows:
  - a. Outside air damper (F-BBB-XX-D1): Modulate to minimum position setpoint at TCP (HC)
  - b. Return air damper (F-BBB-XX-D2): Modulate to maximum position
  - c. Exhaust air damper (F-BBB-XX-D3): Modulate to match outside air damper position
3. Provide Two Position Operating positions as follows:
  - a. Outside air damper (F-BBB-XX-D1): Move to minimum position setpoint at TCP (HC)
  - b. Return air damper (F-BBB-XX-D2): Move to maximum position
  - c. Exhaust air damper (F-BBB-XX-D3): Move to match outside air damper position
- B. Air Filter Alarm: Provide a dirty air filter alarm through a differential pressure switch when its setpoint exceeds .3" W.C. to the TCP for the HVUs, RTUs and ACUs.
- C. Air Cooled Condenser (ACC): Provide on the front of the TCP a red run IL for each ACC.
- D. Hard Wired Control Logic applies to all equipment. Provide the following:
  1. Local Stop/Lock control at each piece of equipment.
  2. Hard wired controls to operate all equipment in the event of a DDC failure.
  3. Inhibit normal equipment operation by the Fire Alarm Control Panel (FACP) as described in the succeeding sections.
  4. Override the FACP equipment shutdown and other controls by the PSP as described in succeeding sections.
  5. Interlocks, safeties, permissives, switches and indicator lights as shown and as specified.
  6. Hard wired control logic that is contained within the TCP and controls related equipment.

7. Mount the following on the TCP face: Hand Switches (HS), Hand Control (HC), Hand/Off/Auto Switches (HOA), Push Buttons (PB), and Indicating Lights (IL).
  8. Includes, but is not limited to, except as modified by the individual sequences of operation:
    - a. Fire Alarm Control Panel (FACP)
    - b. Purge Station Panel (PSP)
    - c. Damper end switch control for each fan specified or shown with an associated two position damper such that if the damper fails to open the fan will not start except as otherwise specified. Provide an alarm in the DDC system and displayed on the OIT when the fan is called upon to run and the damper fails to open.
    - d. HOA switch for each fan with an associated two-position damper for 100 percent outside air units with motor operated dampers.
    - e. HOA switch for each fan with an associated motor operated modulating damper.
    - f. HOA switch for all equipment except for the fans indicated above.
- E. Control Strategy 001 Area Served: Locker Rooms and Toilets (F-ACU-01, F-ACC-01 AND F-EAF-13) (TCP) (100% O.A.)
1. Description: F-ACU-01 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.
    - a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.
    - b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.
    - c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.



## 2. Hard-wired Interlocks

### a. F-ACU-01 operates as follows:

- (1) Starting the fan: When the associated dampers are proved open by the damper end switch, start fan.
- (2) Stopping the fan: Stop the fan and close the associated dampers.

### b. Interlock Exhaust fan F-EAF-13 to operate when F-ACU-01 is operating and each HOA switch is in the AUTO position.

- (1) Starting the fan: When the associated dampers are proved open by the damper end switch, start fan.
- (2) Stopping the fan: Stop the fan and close the associated dampers.

## 3. Temperature Control

### a. F-ACU-01 operates as follows:

- (1) The supply fan operates continuously in occupied mode.
- (2) The supply fan operates on and off based on room temperature in the unoccupied mode.

### b. Cooling: When F-ACU-01 is operating, stage F-ACC-01 to maintain setpoint.

### c. Heating: When F-ACU-01 is operating, modulate the gas burner to maintain setpoint.

## F. Control Strategy 002 Area Served: Lunch Room and Offices (F-ACU-02, F-ACC-02, F-RHC-02, F-RHC-06 AND F-RAF-04) (TCP) (Mixed Air Economizer).

### 1. Description: F-ACU-02 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.

- a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.
- b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.

- c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.
- 2. Hard Wired Control
  - a. Interlock Return Air fan F-RAF-04 to operate when F-ACU-02 is operating and each HOA switch is in the AUTO position.
- 3. Temperature Control
  - a. F-ACU-02 operates as follows:
    - (1) The supply fan operates continuously in occupied mode.
    - (2) The supply fan operates on and off based on room temperature in unoccupied mode.
  - b. Cooling: As room temperature rises above the cooling setpoint, modulate the dampers to maintain the cooling setpoint. When the outside air temperature rises above 70°F close the dampers to the minimum outside air position. On a continued rise of room air temperature above the cooling setpoint return the dampers to their minimum outside air position and cycle F-ACC-02 on and off to maintain the setpoint.
  - c. Heating: On a fall in room temperature, modulate the dampers until the room temperature is below the cooling setpoint. Return the dampers to their minimum outside air position and as the room temperature falls below the heating setpoint, modulate the gas burner to maintain setpoint.
- 4. Reheat Coil F-RHC-02, -06 - Offices - [Conventional Controls]
  - a. Room temperature thermostats controls the electric reheat coils to maintain space temperature due to varying room load.
- G. Control Strategy 003 Area Served: Corridors (F-ACU-03, F-ACC-03 AND F-RAF-05) (TCP) (Mixed Air Economizer).
  - 1. Description: F-ACU-03 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.
    - a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.

- b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.
  - c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.
- 2. Hard Wired Control
  - a. Interlock Return Air fan F-RAF-05 to operate when F-ACU-03 is operating and each HOA switch is in the AUTO position.
- 3. Temperature Control
  - a. F-ACU-03 operates as follows:
    - (1) The supply fan operates continuously in occupied mode.
    - (2) The supply fan operates on and off based on room temperature in unoccupied mode.
  - b. Cooling: As room temperature rises above the cooling setpoint, modulate the dampers to maintain the cooling setpoint. When the outside air temperature rises above 70°F close the dampers to the minimum outside air position. On a continued rise of room air temperature above the cooling setpoint return the dampers to their minimum outside air position and cycle F-ACC-03 on and off to maintain the setpoint.
  - c. Heating: On a fall in room temperature, modulate the dampers until the room temperature is below the cooling setpoint. Return the dampers to their minimum outside air position and as the room temperature falls below the heating setpoint, modulate the gas burner to maintain setpoint.
- H. Control Strategy 004 Area Served: Security Room (F-ACU-04 and F-RHC-01) (TCP) (Mixed Air)
  - 1. General: Provide factory or field installed wired unit communications controls that interface with the DDC system. Provide any miscellaneous interlock or field device mounting, power and wiring to unit provided DDC control panel.
  - 2. Description: F-ACU-04 and its Conventional Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows:

- a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.
  - b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.
  - c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.
3. Provide a Heat-Cool-Fan-Auto-On (HCFAO) switch on the thermostat.
  - a. Heat: Thermostat controls heating to maintain heat setpoint.
  - b. Cool: Thermostat controls F-ACU-04 to maintain cooling setpoint.
  - c. Fan
    - (1) Auto: Thermostat automatically switches between heat and cool modes as required to maintain room temperature.
    - (2) On: Fan runs continuously.
4. Fan Start/Stop
  - a. Provide an Off-Auto (OA) Switch in the TCP. Off-Auto switch selects local control of the supply fan.
  - b. Off: The fan will not operate. Neither heat nor cool cycles operate.
  - c. Auto: The fan starts and stops under DDC command by the operator or when heating/cooling cycles are activated.
5. Temperature Control
  - a. F-ACU-04 operates as follows:
    - (1) The supply fan operates continuously in occupied mode.
    - (2) The supply fan operates on and off based on room temperature in unoccupied mode.
  - b. Cooling: When F-ACU-04 is operating, cycle cooling to maintain setpoint.
  - c. Heating: When F-ACU-04 is operating, stage the electric heater to maintain setpoint.

- d. Provide means controlling the electric heater and F-ACU-04 manually in the event of failure.
- I. Control Strategy 005: Area Served: Operation Room, Maintenance Office and Secured Storage (F-ACU-05, F-ACC-05, F-RAF-01, F-RHC-03 and F-EAF-12) (TCP) (Mixed Air Economizer)
1. General: Provide factory or field installed wired unit communications controls that interface with the DDC system. Provide any miscellaneous interlock or field device mounting, power and wiring to unit provided DDC control panel.
  2. Description: F-ACU-05 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.
    - a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.
    - b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.
    - c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.
  3. Hard Wired Control: Interlock Return Air fan F-RAF-01 and F-EAF-12 to operate when F-ACU-05 is operating and each HOA switch is in the AUTO position.
  4. Fan Start/Stop
    - a. Provide an Off-Auto (OA) Switch in the TCP. Off-Auto switch selects local or DDC control of the supply fan.
    - b. Off: The fan will not operate.
    - c. Auto: The fan starts and stops under DDC command by the operator or when heating/cooling cycles are activated.
  5. Heating/Cooling/Fan Mode
    - a. Heat-Cool-Off-Auto (HCOA) Switch: Provide HCOA switch on the thermostat. HCOA switch selects unit mode operation.

- b. Fan On-Auto Switch: Thermostat selects FAN always On or Auto mode operation.
6. Temperature Control
- a. F-ACU-05 operates as follows:
    - (1) The supply fan operates continuously in occupied mode.
    - (2) The supply fan operates on and off based on room temperature in unoccupied mode.
  - b. Cooling: As room temperature rises above the cooling setpoint, modulate the dampers to maintain the cooling setpoint. When the outside air temperature rises above 70°F close the dampers to the minimum outside air position. On a continued rise of room air temperature above the cooling setpoint return the dampers to their minimum outside air position and cycle ACC on and off to maintain the setpoint.
  - c. Heating: On a fall in room temperature, modulate the dampers until the room temperature is below the cooling setpoint. Return the dampers to their minimum outside air position and as the room temperature falls below the heating setpoint, stage the electric heater to maintain setpoint.
  - d. Provide means controlling the electric heater and F-ACU-05 manually in the event of DDC failure.
  - e. Reheat Coil – Maintenance Office: A room thermostat controls the electric reheat coil to maintain space temperature due to varying room load.
- J. Control Strategy 006: Area Served: - Foreman's Office (F-RTU-01 and F-RAF-02 and F-EAF-11) (TCP) (Mixed Air)
- 1. General: Provide factory or field installed wired unit communications controls that interface with the DDC system. Provide any miscellaneous interlock or field device mounting, power and wiring to unit provided DDC control panel.
  - 2. Description: F-RTU-01 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows:

- a. Occupied mode normal air space setpoints are 70°F heating and 75°F cooling.
  - b. Unoccupied mode normal air space setpoints are 68°F heating and 82°F cooling.
  - c. Provide occupied and unoccupied control by the operator through the DDC or under the DDC time scheduling program.
3. Hard Wired Control: Interlock Return Air fan F-RAF-02 and F-EAF-11 to operate when F-RTU-02 is operating and each HOA switch is in the AUTO position.
4. Fan Start/Stop
  - a. Provide an Off-Auto (OA) Switch in the TCP. Off-Auto switch selects local or DDC control of the supply fan.
  - b. Off: The fan will not operate.
  - c. Auto: The fan starts and stops under DDC command by the operator or when heating/cooling cycles are activated.
5. Heating/Cooling/Fan Mode
  - a. Heat-Cool-Off-Auto (HCOA) Switch: Provide HCOA switch on the thermostat. HCOA switch selects unit mode operation.
  - b. Fan On-Auto Switch: Thermostat selects FAN always On or Auto mode operation.
6. Temperature Control
  - a. F-RTU-02 operates as follows:
    - (1) The F-RTU-02 supply fan operates continuously in occupied mode.
    - (2) The F-RTU-02 supply fan operates on and off based on room temperature in the unoccupied mode.
  - b. Cooling: When F-RTU-02 is operating, cycle cooling to maintain setpoint.
  - c. Heating: When F-RTU-02 is operating, operate the electric heater to maintain setpoint.

- d. Provide means controlling the electric heater and F-RTU-02 manually in the event of DDC failure.
- K. Control Strategy 007: Area Served: Service Rooms (F-HVU-01, F-RCH-04 and F-RAF-06) (TCP) (Mixed Air)
- 1. Description: F-HVU-01 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.
    - a. Normal operation air space setpoints are 65°F Winter and 76°F Summer.
    - 2. Hard Wired Control: Interlock Return Air fan F-RAF-06 to operate when F-HVU-01 is operating and each HOA switch is in the AUTO position.
    - 3. Temperature Control
      - a. F-HVU-01 supply fan operates as follows:
        - (1) The supply fan operates continuously.
        - (2) When the supply fan is not operating the dampers are at their normal positions.
      - b. Ambient Cooling: As room temperature rises above the cooling setpoint, modulate the dampers to maintain the cooling setpoint.
      - c. Heating: On a fall in room temperature, modulate the dampers until the room temperature is below the cooling setpoint. Return the dampers to their minimum outside air position and as the room temperature falls below the heating setpoint, modulate the gas burner to maintain setpoint.
      - d. Reheat Coil - Machine Shop: A room thermostat controls the electric reheat coil to maintain space temperature due to varying room load.
- L. Control Strategy 008: Area Served: Vehicle Maintenance (F-HVU-02 and F-EAF-16) (TCP) (100% O.A.)
- 1. Description: F-HVU-02 and its DDC Control Systems maintain space temperature. Display equipment alarms and system status through the Operator's Interface Terminal (OIT) in the Temperature Control Panel (TCP) and as scheduled to the SCADA system. The system's operation, equipment and control are as follows.



- a. Normal operating air space setpoints are 50°F Winter and 104°F Summer.
- 2. Hard Wired Interlocks
  - a. F-HVU-02 operates as follows:
    - (1) Starting the fan: When associated dampers are proved open by the damper end switch, start fan.
    - (2) Stopping the fan: Stop the fan and close the associated dampers.
  - b. Interlock exhaust fan F-EAF-16 to operate when F-HVU-02 is operating and each HOA switch is in the AUTO position.
    - (1) Starting the fan: When associated dampers are proved open by the damper end switch, start fan.
    - (2) Stopping the fan: Stop the fan and close the associated dampers.
- 3. Temperature Control
  - a. F-HVU-02 supply fan operates as follows:
    - (1) The supply fan operates continuously.
    - (2) When the supply fan is not operating the dampers are at their normal positions.
  - b. Heating: When F-HVU-02 is operating, modulate the gas burner to maintain setpoint.
- M. Control Strategy 009: Area Served: Electrical Room 2 F-SAF-09 and F-EAF-09)
  - 1. Hard Wired Interlocks
    - a. Supply fan F-SAF-09
      - (1) Starting the fan: When the associated dampers are proved open by the damper end switch, start fan.
      - (2) Stopping the fan: Stop the fan and close the associated dampers.
    - b. Interlock Exhaust fan F-EAF-09 to operate when F-SAF-09 is operating and each HOA switch is in the AUTO position.

2. Fan Start/Stop
    - a. HOA Switch: Provide an HOA switch for each fan on the face of TCP. The HOA switch selects local or DDC control of each fan.
    - b. Hand: The fan runs continuously.
    - c. Off: The fan does not run.
    - d. Auto: The fan starts and stops under DDC command by the operator or DDC programmed temperature control.
  3. Temperature Control- [Conventional Controls]: When the space temperature reaches 90°F, both supply and exhaust fans run.
- N. Control Strategy 010: Area Served: Electrical Room 1 (F-SAF-10 and F-EAF-10) (2-Speed Fans)
1. Hard Wired Interlocks
    - a. F-SAF-10 supply fan operates as follows:
      - (1) Starting the fan: When the associated dampers are proved open by the damper end switch, start fan.
      - (2) Stopping the fan: Stop the fan and close the associated dampers.
    - b. Interlock Exhaust fan F-EAF-10 to operate when F-SAF-10 is operating and each HOA switch is in the AUTO position.
      - (1) Starting the fan: When the associated dampers are proved open by the damper end switch, start fan.
      - (2) Stopping the fan: Stop the fan and close the associated dampers.
  2. Fan Start/Stop
    - a. HOA Switch: Provide an HOA switch for each fan on the face of TCP. The HOA switch selects local or DDC control of each fan.
    - b. Hand: The fan runs continuously.
    - c. Off: The fan does not run.
    - d. Auto: The fan starts and stops under DDC command by the operator or DDC programmed temperature control.

3. Temperature Control - [Conventional Controls]
  - a. When the space temperature is between 90°F and 100°F, both supply and exhaust fans run in low speed. When the space temperature is above 100°F, both supply and exhaust fans run in high speed.
- O. Control Strategy 011: Area Served: Unassigned Storage (F-SAF-15, F-RHC-05 and F-EAF-15) (TCP) (Mixed Air)
  1. Fan start/stop
    - a. HOA Switch: Provide HOA switches on the front of the TCP for each supply and exhaust fan. Select local or DDC control of each exhaust and supply fan with the HOA switch.
    - b. Hand: The fan runs continuously.
    - c. Off: The fan does not run.
    - d. Auto: The fan starts and stops under DDC command by the operator or DDC programmed temperature control.
  2. Hard Wired Control: Hard wire the exhaust fan F-EAF-15 to operate when F-SAF-15 is operating and each HOA switch is in the AUTO position.
  3. Temperature Control - [Conventional Controls]: Both supply and exhaust fans run continuously.
  4. Reheat Coil – Unassigned Storage [Conventional Controls]:
    - a. A room temperature thermostat controls the electric reheat coil to maintain space temperature due to varying room load.
- P. Radiant Heaters - [Conventional Controls]: Space mounted electric thermostat cycles for heat. On a call for heat the heater ignition sequence begins. Heater operates to maintain setpoint of 50°F adjustable.
- Q. F-ECV-01 through 07 - Convectors - [Conventional Controls]: Unit mounted thermostat controls are integral with convector. Thermostats control setpoint temperatures of 70°F.
- R. A-EUH-01 through 06 - Unit Heaters - [Conventional Controls]: Unit mounted electric thermostat cycles unit fan to maintain space temperature setpoint of 50°F.

- S. Chimney Automation System: Refer to Section 15551 – Chimney Automation system.

1. Provide alarm from the Chimney Automation Systems control panel to the DDC system. Display alarm on the OIT.

### 3.05 SCADA INTERFACE

- A. Parallel all alarm conditions (TCP) identified as (1) on the DDC points list and provide single contact closure to extend indication (HVAC ALARM/ A Station) to SCADA. Contacts shall be SPDT rated at 5A at 120 volts.

### 3.06 DDC POINTS LIST

- A. List begins at the end of Section

### 3.07 FIELD QUALITY CONTROL

- A. Field Instrument Calibration Requirements: Provide DDC system instrument calibration as follows:

1. Provide the services of experienced instrumentation technicians to field calibrate each instrument to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration.
2. Each instrument to be calibrated at 10, 50 and 90% of span using test instruments to simulate inputs and read outputs. Test instruments to be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments to have accuracies as set forth by the National Bureau of Standards.
3. Provide a written calibration sheet to the City of New York for each field instrument, certifying that it has been calibrated to its specified accuracy. Submit proposal calibration sheets for various types of instruments for City of New York approval prior to the start of calibration. This sheet to include but not be limited to date, instrument tag numbers, calibration data and name of person performing the calibration, calibration, calibration reading as finally adjusted. Maintain a log for all calibrated instruments.
4. Maintain a log for all calibration data for all field and panel instruments. Provide instrument calibration data sheets with the following information:
  - a. Tag Number
  - b. Range
  - c. Span
  - d. Setpoint Range & Setpoint
  - e. Proportional Band Setting
  - f. Integral Setting

- g. Derivative Setting
- h. Remarks (Special Comments)

- B. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1.
- C. Training: Provide training to the operating personnel in the operation and maintenance of the temperature control system as required by Section 01821 - Training and as follows:
  - 1. Provide basic operator training for data display, alarm and status descriptors, requesting data, execution of commands and request of logs.
  - 2. Provide on-site hands-on operator instruction to the operating personnel, during system commissioning and at such time that acceptable performance of the DDC hardware and software has been established.
  - 3. Provide operator instruction at an agreed upon time, during normal working hours by competent representatives familiar with the computer's software, hardware and accessories.
  - 4. Provide operator orientation of the DDC system which includes, but is not limited to, the overall operational program, equipment functions both individually and as part of the total integrated system, commands, advisories, and appropriate operator intervention required in responding to the system's operation.
- D. Tests: After installation of the equipment, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions.
  - 1. Perform prefinal inspection/test as follows:
    - a. Carry out test with controls operating as near as possible to service conditions.
    - b. Correct all defects in the controls.
  - 2. Final Inspection/Test
    - a. Prior to the acceptance test, completely adjust and operate properly all controls.

- b. Notify the Commissioner when the installation is ready for acceptance tests. At least two weeks prior to scheduled acceptance tests, deliver copies of record internal panel layouts and detailed schematic and wiring diagrams to the Commissioner. At the acceptance test, demonstrate the complete functions and proper operation of each control system to the Commissioner. Simulate conditions of off-season temperature and alarms as required for a complete demonstration.

(NO FURTHER TEXT ON THIS PAGE)

Department of Sanitation, NYC  
Marine Transfer Station - Southwest Brooklyn  
DDC System Points and Control Functions  
POINTS FROM EQUIPMENT TO TCP

7/10/12  
2/24/04

BUILDING DESIGNATION F

TODAY  
STARTED

F TCP-1

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITS	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS							NOTES	
						RANGE <sup>4</sup>		ALARM <sup>5</sup>		WARNING <sup>7</sup>				
						LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW		HIGH
F - OAT	T	AI	OUTDOOR AIR TEMPERATURE	oF	RTD	-40	140	10						
F - FACP - 01 - IL	ALL PERSONNAL FANS	DI	FACP SHUTDOWN LIGHT	FACP	CONTACT									
F - ACU - 01 - SS	LOCKER AREAS	DO	FAN START/STOP	ON/OFF	MCC									
F - ACU - 01 - S	-	DI	FAN RUNNING	NML/ALARM	MCC									
F - ACU - 01 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110					
F - ACU - 01 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75					
F - ACU - 01 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP									
F - ACU - 01 - PURG	-	DI	PURGE MODE	ON/OFF	PSP									
F - ACU - 01 - RESET	-	DI	FACP RESET	START/STOP	FACP									
F - ACU - 01 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS									
F - ACU - 01 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85					
F - ACU - 01 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP									(1)
F - EAF - 13	F-ACU-01	DI	FAN START/STOP	ON/OFF	MCC									
F - EAF - 13 - S	F-ACU-01	DI	FAN RUNNING	NML/ALARM	MCC									
F - EAF - 13 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW									
F - EAF - 13 - OL	-	DI	FAN OVERLOAD	NML/ALARM	MCC CONTACT									
F - EAF - 13 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP									
F - EAF - 13 - PURG	-	DI	PURGE MODE	ON/OFF	PSP									
F - EAF - 13 - RESET	-	DI	FACP RESET	START/STOP	FACP									
F - EAF - 13 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS									
F - DIF - 01 - ALM	F-ACU-01,02,03 & HVU-01	DI	DRAFT INDUCER SYSTEM STATUS	NML/ALARM	DIS SWITCH CONTACTS									(1)
F - DIF - 02 - ALM	F-ACU-01,02,03 & HVU-01	DI	DRAFT INDUCER SYSTEM STATUS	NML/ALARM	DIS SWITCH CONTACTS									(1)
F - ACU - 02 - SS	OFFICE, LUNCHROOM, ETC	DO	FAN START/STOP	ON/OFF	MCC									
F - ACU - 02 - S	-	DI	FAN RUNNING	NML/ALARM	MCC									
F - ACU - 02 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110					
F - ACU - 02 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75					
F - ACU - 02 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP									
F - ACU - 02 - PURG	-	DI	PURGE MODE	ON/OFF	PSP									
F - ACU - 02 - RESET	-	DI	FACP RESET	START/STOP	FACP									
F - ACU - 02 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS									
F - ACU - 02 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85					
F - ACU - 02 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP									(1)
F - RAF - 04	F-ACU-02	DO	FAN START/STOP	ON/OFF	MCC									
F - RAF - 04 - S	F-ACU-02	DI	FAN RUNNING	NML/ALARM	MCC									
F - RAF - 04 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW									
F - RAF - 04 - OL	-	DI	FAN OVERLOAD	NML/ALARM	MCC CONTACT									
F - RAF - 04 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP									
F - RAF - 04 - PURG	-	DI	PURGE MODE	ON/OFF	PSP									
F - RAF - 04 - RESET	-	DI	FACP RESET	START/STOP	FACP									
F - RAF - 04 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS									

Department of Sanitation, NYC  
 Marine Transfer Station - Southwest Brooklyn  
DDC System Points and Control Functions  
 POINTS FROM EQUIPMENT TO TCP

F TCP-1  
 BUILDING DESIGNATION F

TODAY 7/10/12  
 STARTED 2/24/04

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS				NOTES		
						RANGE <sup>4</sup>		ALARM <sup>5</sup>			WARNING <sup>7</sup>	
						LOW	HIGH	LOW	HIGH		LOW	HIGH
F - ACU - 03 - SS	CORRIDOR	DO	FAN START/STOP	ON/OFF	MCC							

F - ACU - 03 - SS	CORRIDOR	DO	FAN START/STOP	ON/OFF	MCC					
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Department of Sanitation, NYC

Marine Transfer Station - Southwest Brooklyn

DDC System Points and Control Functions

POINTS FROM EQUIPMENT TO TCP

BUILDING DESIGNATION F

F TCP-1

TODAY  
STARTED

7/10/12  
2/24/04

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS						NOTES	
						RANGE <sup>4</sup>		ALARM <sup>5</sup>		WARNING <sup>7</sup>			
						LOW	HIGH	LOW	HIGH	LOW	HIGH		
F - ACU - 03 - S	-	DI	FAN RUNNING	NML/ALARM	MCC								
F - ACU - 03 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110				
F - ACU - 03 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75				
F - ACU - 03 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - ACU - 03 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - ACU - 03 - SS	-	DI	FACP RESET	START/STOP	FACP								
F - ACU - 03 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								
F - ACU - 03 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85				(1)
F - ACU - 03 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP								
F - RAF - 05	F-ACU-03	DO	FAN START/STOP	ON/OFF	MCC								
F - RAF - 05 - S	F-ACU-03	DI	FAN RUNNING	NML/ALARM	MCC								
F - RAF - 05 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW								
F - RAF - 05 - LO	-	DI	FAN LOCKOUT	NML/ALARM	LOCKOUT SW								
F - RAF - 05 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - RAF - 05 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - RAF - 05 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - RAF - 05 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								
SECURITY RM													
F - ACU - 04			FAN START/STOP	ON/OFF	MCC								
F - ACU - 04 - S		DI	FAN FAILURE	FAIL	TCP								(1)
F - ACU - 04 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP								
F - HVU - 01 - SS	SERVICE ROOMS	DI	FAN START/STOP	ON/OFF	MCC								
F - HVU - 01 - S	-	DI	FAN RUNNING	NML/ALARM	MCC								
F - HVU - 01 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110				
F - HVU - 01 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75				
F - HVU - 01 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - HVU - 01 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - HVU - 01 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - HVU - 01 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								
F - HVU - 01 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85				(1)
F - HVU - 01 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP								
F - RAF - 06	F-HVU-1	DO	FAN START/STOP	ON/OFF	MCC								
F - RAF - 06 - S	-	DI	FAN RUNNING	NML/ALARM	MCC								
F - RAF - 06 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW								
F - RAF - 06 - LO	-	DI	FAN LOCKOUT	NML/ALARM	LOCKOUT SW								
F - RAF - 06 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - RAF - 06 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - RAF - 06 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - RAF - 06 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								

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POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and QITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS					NOTES
						RANGE <sup>4</sup>		ALARM <sup>5</sup>		WARNING <sup>7</sup>	
						LOW	HIGH	LOW	HIGH	LOW HIGH	
F - HVU - 02 - SS	MAINTENANCE AREA	DO	FAN START/STOP	ON/OFF	MCC						
F - HVU - 02 - S	-	DI	FAN RUNNING	NML/ALARM	MCC						
F - HVU - 02 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110		
F - HVU - 02 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75		
F - HVU - 02 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP						
F - HVU - 02 - PURG	-	DI	PURGE MODE	ON/OFF	PSP						
F - HVU - 02 - RESET	-	DI	FACP RESET	START/STOP	FACP						
F - HVU - 02 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS						
F - HVU - 02 - ALM	-	DI	GAS BURNER ALARM	NML/TBL	BURNER PANEL						
F - HVU - 02 - SS	-	AO	GAS MODULATING	ON/OFF	BURNER PANEL						
F - EAF - 16 - S	MAINTENANCE BAY	DO	FAN START/STOP	ON/OFF	MCC						
F - EAF - 16 - ALM	MAINTENANCE BAY	DI	FAN RUNNING	NML/ALARM	MCC						
F - EAF - 16 - LO	-	DI	FAN ALARM	NML/ALARM	CURRENT SW						
F - EAF - 16 - FIRE	-	DI	FAN LOCKOUT	NML/ALARM	LOCKOUT SW						
F - EAF - 16 - PURG	-	DI	FIRE ALARM	NML/ALARM	FACP						
F - EAF - 16 - RESET	-	DI	PURGE MODE	ON/OFF	PSP						
F - EAF - 16 - HOA	-	DI	FACP RESET	START/STOP	FACP						
F - EAF - 16 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS						
F - ACU - 05 - SS	OPERATION ROOM	DO	FAN START/STOP	ON/OFF	MCC						
F - ACU - 05 - S	-	DI	FAN RUNNING	NML/ALARM	MCC						
F - ACU - 05 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110		
F - ACU - 05 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75		
F - ACU - 05 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP						
F - ACU - 05 - PURG	-	DI	PURGE MODE	ON/OFF	PSP						
F - ACU - 05 - RESET	-	DI	FACP RESET	START/STOP	FACP						
F - ACU - 05 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS						
F - ACU - 05 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85		
F - ACU - 05 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP						(1)
F - RAF - 01	F-RTU-02	DO	FAN START/STOP	ON/OFF	MCC						
F - RAF - 01 - S	F-RTU-01	DI	FAN RUNNING	NML/ALARM	MCC						
F - RAF - 01 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW						
F - RAF - 01 - LO	-	DI	FAN LOCKOUT	NML/ALARM	LOCKOUT SW						
F - RAF - 01 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP						
F - RAF - 01 - PURG	-	DI	PURGE MODE	ON/OFF	PSP						
F - RAF - 01 - RESET	-	DI	FACP RESET	START/STOP	FACP						
F - RAF - 01 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS						
F - EAF - 12 - ALM	F-RTU-02	DI	FAN ALARM	ON/OFF	MCC						
F - EAF - 12 - FIRE	-	DO	FIRE START/STOP	NML/ALARM	FACP						
F - EAF - 12 - PURG	-	DI	PURGE MODE	ON/OFF	PSP						
F - EAF - 12 - RESET	-	DI	FACP RESET	START/STOP	FACP						
F - RTU - 02 - SS	FOREMANS OFFICE	DO	FAN START/STOP	ON/OFF	MCC CONTACTS						
F - RTU - 02 - S	-	DI	FAN RUNNING	NML/ALARM	MCC						

Department of Sanitation, NYC

Marine Transfer Station - Southwest Brooklyn

DDC System Points and Control Functions

POINTS FROM EQUIPMENT TO TCP

F TCP-1

BUILDING DESIGNATION

F

TODAY

7/10/12

STARTED

2/24/04

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS				NOTES
						RANGE <sup>4</sup>	ALARM <sup>5</sup>	WARNING <sup>7</sup>		
						LOW	HIGH	LOW	HIGH	

F - RTU - 02 - T - DAT	-	AI	DISCHARGE AIR TEMP	oF	RTD	0	120	45	110	
------------------------	---	----	--------------------	----	-----	---	-----	----	-----	--

Department of Sanitation, NYC  
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 DDC System Points and Control Functions  
 POINTS FROM EQUIPMENT TO TCP

7/10/12  
 2/24/04

TODAY  
 STARTED

BUILDING DESIGNATION F

F TCP-1

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS						NOTES
						RANGE <sup>4</sup>		ALARM <sup>5</sup>		WARNING <sup>7</sup>		
						LOW	HIGH	LOW	HIGH	LOW	HIGH	
F - RTU - 02 - S - FILTER	-	DI	DIRTY FILTER	NML/ALARM	DIFF PRESSURE SW	0	1	0.25	0.75			
F - RTU - 02 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - RTU - 02 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - RTU - 02 - SS	-	DI	FACP RESET	START/STOP	FACP							
F - RTU - 02 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS							
F - RTU - 02 - T - SP	-	AI	ROOM TEMPERATURE	oF	RTD	40	120	65	85			(1)
F - RTU - 02 - S	-	DO	UNIT TROUBLE	TROUBLE	TCP							
F - RAF - 02	F-RTU-02	DO	FAN START/STOP	ON/OFF	MCC							
F - RAF - 02 - S	-	DI	FAN RUNNING	NML/ALARM	MCC							
F - RAF - 02 - OL	-	DI	FAN OVERLOAD	NML/ALARM	MCC CONTACT							
F - RAF - 02 - LO	-	DI	FAN LOCKOUT	NML/ALARM	LOCKOUT SW							
F - RAF - 02 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - RAF - 02 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - RAF - 02 - RESET	-	DI	FACP RESET	START/STOP	FACP							
F - RAF - 02 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS							
F - EAF - 11	F-RTU-02	DO	FAN START/STOP	ON/OFF	MCC							
F - EAF - 11 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW							
F - EAF - 11 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - EAF - 11 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - EAF - 11 - RESET	-	DI	FACP RESET	START/STOP	FACP							
F - SAF - 10	ELECTRICAL RM 1	DO	FAN START/STOP	ON/OFF	MCC							
F - SAF - 10 - S	-	DI	FAN RUNNING	NML/ALARM	MCC							
F - SAF - 10 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - SAF - 10 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - SAF - 10 - RESET	-	DI	FACP RESET	START/STOP	FACP							
F - SAF - 10 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS							
F - EAF - 10 - SS	ELECTRICAL RM 1	DO	FAN START/STOP	ON/OFF	MCC							
F - EAF - 10 - S	-	DI	FAN RUNNING	NML/ALARM	MCC							
F - EAF - 10 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - EAF - 10 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - EAF - 10 - RESET	-	DI	FACP RESET	START/STOP	FACP							
F - EAF - 10 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS							
F - SAF - 15 - SS	UNASSIGNED STORAGE	DO	FAN START/STOP	ON/OFF	MCC							
F - SAF - 15 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW							
F - SAF - 15 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							
F - SAF - 15 - PURG	-	DI	PURGE MODE	ON/OFF	PSP							
F - SAF - 15 - RESET	-	DI	FACP RESET	START/STOP	FACP							
F - SAF - 15 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS							
F - EAF - 15 - SS	UNASSIGNED STORAGE	DO	FAN START/STOP	ON/OFF	MCC							
F - EAF - 15 - ALM	-	DI	FAN ALARM	NML/ALARM	CURRENT SW							
F - EAF - 15 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP							

Department of Sanitation, NYC  
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TODAY 7/10/12  
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BUILDING DESIGNATION F

F TCP-1

POINT ID <sup>1</sup>	AREA OR SYSTEM SERVED	POINT TYPE <sup>2</sup>	POINT FUNCTION	DISPLAY at OP CONSOLE and OITs	INPUT / OUTPUT DEVICES <sup>3</sup>	ANALOG INPUTS							NOTES
						RANGE <sup>4</sup>		ALARM <sup>5</sup>		WARNING <sup>7</sup>			
						LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	
F - EAF - 15 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - EAF - 15 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - EAF - 15 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								
F - SAF - 9 - SS	ELECTRICAL RM 2	DO	FAN START/STOP	ON/OFF	MCC								
F - SAF - 9 - S	-	DI	FAN RUNNING	NML/ALARM	MCC								
F - SAF - 9 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - SAF - 9 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - SAF - 9 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - SAF - 9 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								
F - EAF - 9 - SS	ELECTRICAL RM 2	DO	FAN START/STOP	ON/OFF	MCC								
F - EAF - 9 - S	-	DI	FAN RUNNING	NML/ALARM	MCC								
F - EAF - 9 - FIRE	-	DI	FIRE ALARM	NML/ALARM	FACP								
F - EAF - 9 - PURG	-	DI	PURGE MODE	ON/OFF	PSP								
F - EAF - 9 - RESET	-	DI	FACP RESET	START/STOP	FACP								
F - EAF - 9 - HOA	-	DI	MODE SWITCH	HOA	SWITCH CONTACTS								

-END OF SECTION-

**Section 15946**  
**AIR MONITORING**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for providing equipment, materials, labor and services for a complete air monitoring system including gas monitors, gas detectors, gas calibration equipment, audible and visual alarms, spare parts, interconnecting wiring and accessories as required for a complete air monitoring system as indicated.

**1.02 RELATED SPECIFICATIONS**

- A. Section 09911 - Exterior Painting
- B. Section 09912 - Interior Painting
- C. Section 15900 - HVAC Controls
- D. Section 17600 - SCADA System - Control Strategies
- E. Division 16 - Electrical

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. ANSI MC 85.1M - Terminology for Automatic Control
  - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
  - 3. NEC - National Electrical Code

**1.04 SYSTEM DESCRIPTION**

- A. Design Requirements: Provide a central air monitoring system capable of continuously detecting and monitoring ambient air for carbon monoxide, and nitrogen dioxide at multiple remote locations, as shown, using a programmable micro-processor based unit with multi channels of communications to remote gas sensor/transmitters designed to measure gas concentrations.
- B. Provide a multi-channel monitoring system with multiple transmitters each, capable of displaying gas concentration values and providing remote warning, alarm and control signals for each gas monitored.

**1.05 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.

- B. Product Data and Information: Submit catalog data for the gas monitors, gas sensor units, alarms and gas calibration equipment.
- C. Shop Drawings: Submit Shop Drawings for the air monitoring system including arrangement of all equipment and controls, panel dimensions, mounting, schematic control diagrams, wiring diagrams, identified terminals for external wiring, complete description of the monitoring system, and a materials list.
- D. Revisions: Revise shop drawings to reflect actual installation and operating sequence and submit these as Project Record Documents.
- E. Operation and Maintenance Manuals: Submit Operation and Maintenance Data in an Operation and Maintenance Manual as specified in Section 01831 including interconnection wiring diagrams complete for field installed system with identified and numbered system components and devices. Also, include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer: Provide products from a company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience.
- B. Installer: Use a company specializing in installing equipment specified in this Section approved by the manufacturer.
- C. Start Up: Start up to include testing and calibration of each sensing unit installed according to manufacture's recommendations.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.
- B. Handling: Handle air monitoring equipment and accessories carefully to prevent damage. Do not install damaged equipment or accessories. Replace damaged equipment with new.
- C. Storage and Protection: Store air monitoring equipment and accessories in a clean dry place. Protect from weather dirt, construction debris, and physical damage.

#### 1.08 COORDINATION

- A. General: Coordinate Work in accordance with the requirements contained in Division 1.
- B. Other Components: Furnish installation of components complementary to the installation of similar components in other systems. Coordinate installation of system components with installation of mechanical systems and controls.

## 1.09 SPARE PARTS

- A. General: Provide spare parts according to the following table:

<u>Gas Monitors Installed</u>	<u>Spare Parts</u>
1-2	One control module
<u>Sensing Heads - Each Type Installed</u>	<u>Required - Each Gas Monitored</u>
1-10 Class 1 Div 1 Group B,C,D	One sensor head assembly
1-10 All Types	One calibration gas cylinder

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
- B. Air Monitoring Equipment
1. Mine Safety Appliances Company
  2. Vulcain Inc.
- C. Gas Monitor
1. Mine Safety Appliances Co. - (5000 Series)
  2. Vulcain Inc.
- D. Gas Sensor Units
1. Mine Safety Appliances Company
  2. Vulcain Inc.
- E. Gas Calibration Equipment
1. Mine Safety Appliances Co.
  2. Vulcain Inc.
- F. Alarm Horn, Nonexplosion-proof
1. Edwards - Model 5531



## G. Alarm Light, Nonexplosion-proof

1. Federal Signal Corp. - Model 225XL-120-240F light with a Model LWM B2 aluminum mounting bracket

## 2.02 MATERIALS

- A. General: Have a single supplier provide air monitoring components in one or more prefabricated gas monitor cabinets, gas sensors, audible and visual alarms, gas calibration equipment and spare parts for the air monitoring system; provide complete wiring diagrams; make equipment calibration and adjustment; supervise the system installation and guarantee all components. Furnish and install detector assemblies and analyzers with required accessories and appurtenances.
- B. Design: Provide the monitoring system to operate on the catalytic oxidation principle or the electro-chemical principle.
- C. Provide the air monitoring system to measure and display the gas concentration and provide audible and visual alarms when preset limits are exceeded. Provide relay outputs for alarms and analog signals representing gas concentrations.
- D. Provide the system consisting of a pre-configured multi channel gas monitor with separate gas sensor/transmitter units, audible/visual alarms for each point, gas calibration equipment and interconnecting wiring. Provide gas sensor units capable of being located remote from the control module by up to 2000 feet. Provide gas sensor units which receive power from and send signals corresponding to gas values to the gas monitor.
- E. Provide the gas monitor to be microprocessor based and compatible with all of the gas sensors of the same manufacturer to detect toxic gases. Provide the gas monitor with a digital display and two adjustable alarm levels: warning and alarm. Provide each point having alarm relays for each alarm level as specified.
- F. When an alarm is energized, the air monitoring system shall operate the alarm system. Furnish the necessary relays and auxiliary contacts to provide remote alarms and the operation of the ventilation equipment. Gas transmitters or sensors must contain 4-20mA output.
- G. Design gas monitoring equipment for the atmospheres and conditions in which it will be installed. Provide Class 1 Div 1 Group B, C, D Enclosures for transmitter/sensors with the ability to remote sensing technology from transmitter portion and capable of remote calibration of remote sensor.
- H. Provide gas monitors and gas detector assemblies that are approved by Factory Mutual Engineering Corporation or the Canadian Standards Association and NYC Buildings Department MEA

- I. Provide electrical conduit and wiring between the air monitoring system components, including alarms.
- J. Wiring and conduit between the gas monitoring system panel for alarm connection to the SCADA system and operation of the ventilation system.
- K. Power wiring to the gas monitor panel.
- L. Provide electrical wiring, and conduit required in accordance with Division 16 and the approved wiring diagrams.
- M. Provide the number and type of monitoring points as follows:

<u>Gas</u>	<u>Range/Full Scale</u>	<u>No. of Points</u>
Carbon Monoxide (CO)	0-500 ppm	8/station
Nitrogen Dioxide (NO <sub>2</sub> )	0-5 ppm	8/station

## 2.03 GAS MONITOR

- A. General: Provide a gas monitor of the enclosed wall mount type in general purpose NEMA 12 enclosure.
- B. Access: Provide access to the inside of the enclosure, monitor front panel, and wiring connections through a hinged, front facing, full length door.
- C. Access Door: Provide the door with a shatterproof window of sufficient size to allow the viewing of all meters and alarm indicating lights.
- D. Wiring Connections: Mark all wiring connections with functional designations such that connections can be made without the use of diagrams or tables. Provide all connections easily accessible from the front.
- E. External Controls: Provide an external sealed switch to allow for alarm reset and audible alarm silencing without opening the enclosure.
- F. Readout Display: Provide an alphanumeric display to display the value of each sensor and keypad for navigation.
- G. Visual Alarm Indicators: Furnish separate indicating lights for Caution Warning and Alarm for each gas sensor. Use color coded lights.
- H. Alarm Set Point Levels: Provide three separate alarm set point levels for each sensor which are independently adjustable for any value within the readout range. Arrange the set points to provide drive signals to the user interface relays. Supply at least two of the three alarm set points per sensor with the capability of providing the user a selection of latching or nonlatching mode.

- I. Relay Outputs: Have the alarm set point drive signals activate user relays as follows:
  - 1. Number of Relays - Furnish the necessary relays and auxiliary contacts to provide remote alarms and operate the ventilation system. As a minimum, provide relays for each WARNING level and ALARM level for each monitored gas in each monitored space. As a minimum, provide two relays for each set point level for every multiple of six sensors.
  - 2. Time Delay - To prevent chatter or control oscillation provide at least half the relays capable of being programmed to provide reset time delay when the relay is used in the nonlatching mode. Provide a time delay of up to 15 minutes.
  - 3. Set point Drive Deselect - Provide switches or keypad with security code to allow the user to deselect a set point drive signal from activating a relay.
  - 4. Contact Rating - Provide all relays as Form C dry contact, double pole, double-throw. Rate contacts for 5 amps resistive at 120-volt ac.
  - 5. Contact Selection - Provide contacts capable of being selected normally open or normally closed.
- J. Malfunction Indication: Provide system trouble indication as follows:
  - 1. Trouble Relay - Provide a relay to indicate trouble when any of the following conditions exist.
    - a. System power loss
    - b. Signal loss from any sensor
    - c. 15 percent or greater under range
  - 2. Display Indication - Display a separate unique character on the readout display when an over range or greater than 10 percent under range condition exists.
- K. Audible Alarm: Provide an audible horn or buzzer when an alarm condition occurs.
- L. Output signals: Provide a 4-20 ma signal representing the gas concentration for each gas sensor in the system. Make the signal capable of driving a 250 ohm load.

M. Controls: Provide controls as follows:

1. Operating Modes and Parameters Selection - Accomplish the following selections by the use of a keypad or other means that do not involve the use of tools:
  - a. Display range value
  - b. Latching or nonlatching mode for at least two alarm set point drivers
  - c. Relay reset time delay
  - d. Deselect of alarm set point driving a relay
  - e. Removing any point from service
  - f. Increasing or decreasing alarm action
2. Front Panel Controls - Accomplish the following functions by using push button type controls readily accessible on the front panel:
  - a. Display of alarm set point level on the read out display described in subparagraph H.
  - b. Resetting any alarm set point
  - c. Temporary disabling any specific sensor from affecting the system
  - d. Silencing of audible alarm
  - e. Resetting any latching relay if alarm condition is cleared

N. System Power Requirements: Provide for system operation on 115-volt ac, 60 hertz. Do not exceed 200 VA per 10 system points.

O. Maximum System Maintenance Requirements: Design the system such that periodic sensor checking or actual adjustment of the sensor units can be accomplished by one person at the sensor unit location. Sensors calibration must not require opening the sensor enclosure or declassification of space. Sensors should require quarterly inspection and calibration..

P. UL Listing: Provide, as a minimum, the following parts of the system with UL approval.

1. All primary ac components including connectors
2. All user relays
3. All remote sensor unit enclosures

## 2.04 GAS SENSOR UNITS

- A. Sensor Configuration: Provide sensor/transmitters of the indicating (remote if required) type.
  - 1. Provide sensors of the non-intrusive type that do not require declassification of environment for the purpose of calibration. Provide sensors that do not require the opening of enclosure for purpose of calibration.
  - 2. Provide sensors/transmitters mounted in an epoxy coated conduit enclosure at elevation shown and specified.
- B. Gas Monitor to Sensor Unit Interconnection: Provide interconnect wiring, the sensor operating voltage and sensor signal in accordance with the following:
  - 1. Provide interconnect wiring as 2-wire shielded cable in conduit.
  - 2. To eliminate radio frequency interference and electromagnetic interference, provide the signal from the sensor to the monitor to be in digital format or frequency format.
  - 3. Do not exceed 24-volt dc for the voltage supplied to the sensor.
- C. Toxic Gas Sensors: Provide toxic gas sensors of the electrochemical type. Provide sensors which do not require the periodic addition of reagents.
- D. Sensing Element Useful Life: Provide sensing elements which have a minimum useful life of one year. Provide a replacement sensor at no charge for sensors that do not meet this minimum requirement within one year from the date of substantial completion.
- E. Sensing Element Remote Location: Sensing elements must be capable of remove location of up to 100 feet from transmitter body.
- F. Products
  - 1. MSA Series Ultima XIR sensor
  - 2. or approved equal

## 2.05 GAS CALIBRATION EQUIPMENT

- A. Calibration Kit: Provide a calibration kit for field checking the calibration of the gas detection systems. Provide kits which include a light weight carrying case, dispensing valve, regulator assembly and hose, test coils and necessary calibration gas cylinders for each type of gas monitored.

## 2.06 ALARM HORN - NONEXPLOSION-PROOF TYPE

- A. General: Provide the alarm horn as a solid state signaling device consisting of a multiple tone generator, audio amplifier and speaker. Provide an alarm capable of producing four different user selected audible output signals from a programmable tone generator with a priority tone selection capability. Use UL listed units.
- B. Electrical Requirements: Operate the signal from a 120-volt, 60 hertz, power supply and mount in accordance with the National Electric Code requirements.
- C. Signal Features: Provide the unit with the capability of accepting four different inputs without the addition of other housings or modules. Provide the four tones as field selectable by the City by using the miniature programming switches inside the unit. Provide the unit meeting the following requirements.
  - 1. A unit which requires changing tone modules to accomplish tone selection will not be acceptable.
  - 2. Provide one of the programmed tones as a priority, overriding tone.
  - 3. Provide a minimum of 13 tones to select from including: horn, warble, siren, vibrato, slow whoop, fast whoop, beep, stutter, chime, hi-lo, rapid siren, yeow and ding-dong.
  - 4. Provide audio amplifier portion of the signal unit with short circuit and overload protection as an integral part of the circuit design.
  - 5. Design the unit for heavy-duty use.
- D. Sound Level: Provide the signal unit from the factory with the sound level set at maximum output, but easily field adjustable for the required decibel level. Provide the speaker portion of the signal unit with a lateral position adjustment. Provide the unit meeting the following requirements.
  - 1. Supply the initial tone selection for any ALARM signal with a repeating rapid siren tone signal that varies from 600 to 1,250 hertz high to low tone at four cycles per second. This signal has priority over a WARNING alarm signal.
  - 2. Provide initial tone selection for any WARNING alarm as a repeating alternating high-low tone signal that varies from 780 to 600 hertz tones at 0.52 second intervals for each tone.

## 2.07 ALARM LIGHT

- A. Nonexplosion-Proof: Provide a nonexplosion-proof NEMA 4X rated, LED-type alarm light having 65 flashes per minute in a red double fresnel lens made of

shatter resistant polycarbonate dome with an anodized aluminum base for operation at 120-volt ac. Mount the light on a cast aluminum mounting bracket.

## 2.08 CARBON MONOXIDE AND NITROGEN DIOXIDE

A. General: Provide a carbon monoxide gas detection system to continuously monitor ambient air for carbon monoxide and nitrogen dioxide at locations as shown and as follows.

1. Provide a complete integrated system including a multi-channel gas monitor, gas sensors, audible and visual alarms, interconnecting wiring and calibration kit. Provide an independent monitoring channel for each gas sensor having a full scale range as specified.
2. Provide the carbon monoxide and nitrogen dioxide gas detection system to operate on the principle of electro conductivity. Provide detectors which are unaffected by ambient temperature in the range of -40 to 100 degrees F and relative humidity between 0 and 95 percent non condensing. Do not allow response time to exceed 90 seconds to 90 percent of step change.

### B. Alarms

1. Provide gas alarms for the following gas concentration alarm levels:
  - a. Carbon Monoxide WARNING level - 35 ppm
  - b. Carbon Monoxide ALARM level - 200 ppm
  - c. Nitrogen Dioxide WARNING level - 1 ppm
  - d. Nitrogen Dioxide ALARM level - 2 ppm
2. Provide the following circuits and alarms in response to a WARNING signal from the gas detectors:
  - a. Provide and activate a strobe light and horn (1st tone) alarm in the room.
  - b. Close a relay to operate the emergency ventilation system as shown in electrical drawings and report to SCADA system.
3. Provide the following circuits and alarms in response to an ALARM signal from the gas detectors:
  - a. Provide and activate a strobe light and horn (2nd tone) alarm in the room.
  - b. Provide and activate a strobe light alarm outside each entrance to the room.

- c. Close a relay to advise SCADA of the alarm and maintain the operation of the emergency ventilation system.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. General: Examine air monitoring systems components for damaged or missing parts. Examine areas and conditions for compliance with requirements for installation tolerances. Do not proceed until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Install air monitoring equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Install equipment with required accessories and appurtenances. Locate gas monitors and gas sensors where shown.
- B. Electrical Wiring: Install electrical wiring including required conduit in accordance with Division 16 and the approved wiring diagrams.
- C. Conduit Openings: Caulk gas tight all conduit openings through walls separating the Monitored Area from adjacent areas of the facility in accordance with Division 16 Sections.
- D. Sensor Location: CO 5 feet off the floor and NO<sub>2</sub> 1-3 feet from top of ceiling.
- E. Alarms: Set alarms for the following levels of gas concentration:

Alarm Level	Alarm Set Point
Carbon Monoxide WARNING	35 ppm
Carbon Monoxide ALARM	200 ppm
Nitrogen Dioxide WARNING	1 ppm
Nitrogen Dioxide ALARM	2 ppm

### 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Furnish the services of a qualified representative of the manufacturer to provide instruction on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment and place the equipment in trouble-free operation, as specified in Division 1. Provide a minimum of 8 hours of training.



- B. Tests: After installation of the air monitoring system, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions and as follows:
1. Perform Prefinal Test as follows:
    - a. Calibrate equipment and set alarms.
    - b. Carry out test with the equipment operating as near as possible to service conditions.
    - c. Correct all defects in the equipment at no cost to the City of New York.
  2. Perform Final Test as follows:
    - a. Prior to the acceptance test, determine that all controls are completely adjusted and operating properly.
  3. Notify the Commissioner when the installation is ready for acceptance tests. At least 2 weeks prior to scheduled acceptance tests, deliver copies of records detailed schematic and wiring diagrams. Demonstrate at the acceptance test the complete functions and proper operation of the air monitoring system. Simulate conditions of gas concentration alarms as required for a complete demonstration.

-END OF SECTION-

**Section 15950**  
**TESTING, ADJUSTING AND BALANCING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for providing and installing the following:
  - 1. Testing, adjustment and balancing of air systems.
  - 2. Measurement of final operating conditions of HVAC systems.

**1.02 REFERENCES**

- A. Codes and standards referred to in this Section include:
  - 1. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
  - 2. ASHRAE- Most Recent Systems Handbook: Chapter 57, Testing, Adjusting and Balancing.
  - 3. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

**1.03 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Testing and Balancing Agency: Submit the name and qualifications of the testing, adjusting and balancing agency and their personnel for approval within 30 days after Notice to Proceed is issued.
- C. Test Reports: Submit a complete set of all approved tests prior to final acceptance.
- D. System Testing and Balancing: Submit a detailed account of the proposed methods and sequence to carry out system testing and balancing.
- E. Draft Reports: Prior to commencing the Work, submit draft reports indicating adjusting, balancing and equipment data required. Submit three draft copies of the report for review prior to final acceptance. Provide three final copies for the City of New York and for inclusion in the operation and maintenance manuals.
- F. Reports Quality: Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include a set of reduced drawings with air outlets and inlets, and equipment identified to correspond with the data sheets, and indicating thermostat locations.

- G. Testing and Balancing Equipment: Submit data sheets of specific instruments to be used, listing their most recent calibration dates prior to commencing system balance.
- H. Other Requirements: Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guarantee, prior to commencing the system balance.

#### 1.04 REPORT FORMS

- A. General: Submit reports on AABC National Standards for Total System Balance or NEBB forms.
- B. Format: Include the following information on the report forms:
  - 1. Title Page
    - a. Company name
    - b. Company address
    - c. Company telephone number
    - d. Project name
    - e. Project location
    - f. Project ENGINEER
    - g. Project CONTRACTOR
    - h. Project altitude
  - 2. Instrument List
    - a. Instrument
    - b. Manufacturer
    - c. Model
    - d. Serial number
    - e. Range
    - f. Calibration date
  - 3. Air Handling Equipment
    - a. Identification/Location
    - b. Manufacturer
    - c. Model/Size
    - d. Air flow, design and actual
    - e. Return air flow, design and actual
    - f. Outside air flow, design and actual
    - g. Total static pressure (total external), design and actual
    - h. Inlet pressure
    - i. Discharge pressure
    - j. Fan RPM

4. Exhaust Fan Data
  - a. Identification/Location
  - b. Manufacturer
  - c. Model/Size
  - d. Air flow, design and actual
  - e. Total static pressure (total external), design and actual
  - f. Inlet pressure
  - g. Discharge pressure
  - h. Fan RPM
5. Supply Fan Data
  - a. Identification/Location
  - b. Manufacturer
  - c. Model/Size
  - d. Air flow, design and actual
  - e. Total static pressure (total external), design and actual
  - f. Inlet pressure
  - g. Discharge pressure
  - h. Fan RPM
6. Return Air/Outside Air Data
  - a. Identification/Location
  - b. Design air flow
  - c. Actual air flow
  - d. Design return air flow
  - e. Actual return air flow
  - f. Design outside air flow
  - g. Actual outside air flow
  - h. Return air temperature
  - i. Outside air temperature
  - j. Required mixed air temperature
  - k. Actual mixed air temperature
  - l. Design outside/return air ratio
  - m. Actual outside/return air ratio
7. Electric Motors
  - a. Manufacturer
  - b. HP/BHP
  - c. Phase, voltage, amperage; nameplate, actual, no load
  - d. RPM
  - e. Enclosure
  - f. Service factor
  - g. Starter size, rating, heater elements

## 8. V-Belt Drive

- a. Identification/Location
- b. Required driven RPM
- c. Driven sheave, diameter and RPM
- d. Belt, size and quantity
- e. Motor sheave, diameter and RPM
- f. Center to center distance, maximum, minimum and actual

## 9. Duct Traverse

- a. System zone/branch
- b. Duct size
- c. Area
- d. Design velocity
- e. Design air flow
- f. Actual velocity
- g. Actual air flow
- h. Duct static pressure
- i. Air temperature
- j. Air correction factor

## 10. Air Distribution Test Sheet

- a. Air terminal number
- b. Room number/location
- c. Terminal type
- d. Terminal size
- e. Area factor
- f. Design velocity
- g. Design air flow
- h. Actual velocity
- i. Actual air flow
- j. Percent of design air flow

## 11. Terminal Unit Data

- a. Identification/Location
- b. Manufacturer
- c. Model/Size
- d. Type, constant, variable, single, dual duct
- e. Minimum static pressure
- f. Minimum design air flow
- g. Maximum design air flow
- h. Maximum actual air flow
- i. Inlet static pressure

## 12. Electric Duct Heater

- a. Identification/Location
- b. Manufacturer
- c. Model/Size
- d. Design kW
- e. Number of stages
- f. Phase, voltage, amperage
- g. Actual voltage (each phase)
- h. Actual amperage (each phase)
- i. Air flow, design and actual
- j. Temperature rise, design and actual

## 13. Air Cooled Condenser

- a. Identification/Location
- b. Manufacturer
- c. Model/Size
- d. Entering DB air temperature, design and actual
- e. Leaving DB air temperature, design and actual
- f. Number of compressors

## 14. Cooling Coil Data

- a. Identification/Location
- b. Manufacturer
- c. Service
- d. Air flow, design and actual
- e. Entering air DB temperature, design and actual
- f. Entering air WB temperature, design and actual
- g. Leaving air DB temperature, design and actual
- h. Leaving air WB temperature, design and actual
- i. Air pressure drop, design and actual

## 15. Heating Coil Data

- a. Identification/Location
- b. Manufacturer
- c. Service
- d. Air flow, design and actual
- e. Entering air temperature, design and actual
- f. Leaving air temperature, design and actual
- g. Air pressure drop, design and actual

## 16. Sound Level Report

- a. Location
- b. Octave bands - equipment off
- c. Octave bands - equipment on

## 17. Vibration Test

- a. Location of points
  - (1) Fan bearing, drive end
  - (2) Fan bearing, opposite end
  - (3) Motor bearing, center (if applicable)
  - (4) Motor bearing, drive end
  - (5) Motor bearing, opposite end
  - (6) Casing (bottom or top)
  - (7) Casing (side)
  - (8) Duct after flexible connection (discharge)
  - (9) Duct after flexible connection (suction)
- b. Test readings
  - (1) Horizontal, velocity and displacement
  - (2) Vertical, velocity and displacement
  - (3) Axial, velocity and displacement
- c. Normally acceptable readings, velocity and acceleration
- d. Unusual conditions at time of test
- e. Vibration source (if noncomplying)

## 18. Duct Leak Test

- a. Description of ductwork under test
- b. Duct design operating pressure
- c. Duct design test static pressure
- d. Duct capacity, air flow
- e. Maximum allowable leakage duct capacity times leak factor
- f. Test apparatus
  - (1) Blower
  - (2) Orifice, tube size
  - (3) Orifice size
  - (4) Calibrated
- g. Actual static pressure
- h. Actual orifice differential pressure
- i. Leakage

1.05 PROJECT RECORD DRAWINGS

- A. General: Submit Record Drawings as specified in Section 01332 – Record Drawings.
- B. Location Record: Accurately record actual locations of flow measuring stations balancing valves and rough setting.

1.06 QUALITY ASSURANCE

- A. Provide services from a company specializing in the testing, adjusting and balancing of systems specified in this Section with minimum 3 years documented experience certified by AABC or NEBB.
  - 1. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.
  - 2. Perform the total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental System.

1.07 SEQUENCING AND SCHEDULING

- A. Sequence the Work to commence after completion of systems and schedule completion of Work before Substantial Completion. Schedule and provide assistance in final adjustment and test of life safety, smoke evacuation and smoke control system with the City of New York Fire Department.

1.08 PRE-INSTALLATION

- A. Conference: Convene a conference 1 week prior to commencing testing as specified in Section 01310 – Project Coordination.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 EXAMINATION

- A. General: Before commencing Work, verify that the systems are complete and operable. Verify the following:
  - 1. Equipment is operable and in a safe and normal condition
  - 2. Temperature control systems are installed complete and operable
  - 3. Proper thermal overload protection is in place for electrical equipment



4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris
  6. Fan rotations are correct
  7. Fire and volume dampers are in place and open
  8. Coil fins have been cleaned and combed
  9. Access doors are closed and duct end caps are in place
  10. Air outlets are installed and connected
  11. Duct system leakage has been minimized
- B. Defects and Deficiencies: Report any defects or deficiencies noted.
- C. System Imbalance: Promptly report abnormal conditions in mechanical systems or conditions which prevent system balancing.
- D. Acceptance of Existing Conditions: Beginning of testing means acceptance of existing conditions.

### 3.02 PREPARATION

- A. Additional Balancing: Provide additional balancing devices as required.
- B. Instruments: Provide instruments required for testing adjusting and balancing operations. Make these instruments available to facilitate spot checks during testing.

### 3.03 INSTALLATION TOLERANCES

- A. Air Systems: Adjust the air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from the design figures indicated.

### 3.04 ADJUSTING

- A. Completion: Properly install, inspect and confirm proper operation of each individual component of the system before giving notice to proceed with testing, adjusting and balancing. Do not perform testing, adjusting and balancing until all mechanical equipment is properly installed and is 100 percent operational, all temperature controls are installed and calibrated and all systems are cleaned and clean filters installed.

- B. **Deficiency and Correction:** Assist in the system testing, adjusting and balancing. Adjust the system and make corrections of any deficiencies found such as: motor starters and horsepower; improper sheave and belt sizes; missing, improperly installed or malfunctioning volume control dampers, air extractors, power wiring, controls and any other items that prevent the completion of the system testing, adjusting and balancing.
- C. **Recorded Data:** Record data representing actually measured, or observed conditions.
- D. **Settings:** Permanently mark settings of dampers and other adjustment devices then allow the balanced settings to be restored.
- E. **Balance Verification:** After adjustment, take measurements to verify that the balance has not been disrupted or that such disruption has been rectified.
- F. **Operating Systems:** Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to the specified settings.

### 3.05 AIR SYSTEM TESTING AND BALANCING

- A. **Perform air system balancing as follows:**
  - 1. Check filters for cleanliness and minimum bypass leakage, dampers both volume and fire for correct position, and temperature controls for completeness of installation.
  - 2. Prepare test report sheets for fans, and air inlets and outlets. Obtain the manufacturer's flow factors and follow the recommended procedure of testing.
  - 3. Open all supply dampers, and place all fans in specified operation.
  - 4. Check motor amperage and voltage for each motor, fan rotation, and automatic dampers for proper position.
  - 5. Check air temperature controls and verify that they are operating to deliver design temperatures. Adjust the system with mixing dampers positioned under the minimum outdoor air condition.
  - 6. Using pitot tube and calibrated manometer, traverse the main duct and all main branches and ascertain the total air being delivered. Adjust or replace pulleys and belts and install additional dampers if required to obtain the design airflow. Make adjustments so that all finally adjusted air quantities are at least equal to, but more than 10 percent above, the air quantities noted on the Contract Drawings.

7. Adjust branch dampers until the proper air volume is obtained in each branch duct.
8. Commence terminal outlet balancing beginning with the outlets nearest the fan. Use branch dampers for major adjusting and terminal dampers for minor adjustments only.
9. Make additional test and adjustment passes through entire systems as necessary to obtain the noted outlet values.
10. Read and record amperage readings for each motor lead, fan static and velocity pressures and the static pressure drop across each major component (i.e., intake, filters, coils).
11. Reposition system dampers to supply maximum outdoor air and record the amperage and pressure readings in this position.
12. Adjust air terminal outlets for proper distribution pattern.
13. Inspect and test all electrical protective devices and circuits for proper motor protection, including properly sized starter overload heater elements, for all equipment furnished.
14. Provide a system schematic with the required and actual air quantities recorded at each outlet or inlet.
15. When modulating dampers are provided, take measurements and balance the system at extreme conditions.
16. Measure building static pressure and adjust the supply, return and exhaust air systems to provide the required relationship to maintain approximately 0.05 inches positive static pressure for each zone near building entries.
17. Adjust air quantities with mixing dampers first set for summer ventilation, then for heating, then modulating.
18. Permanently mark the balance position of all manual volume dampers, and replace all access covers.

### 3.06 OPERATION DEMONSTRATION

- A. When each system has been completed and proved functional, demonstrate its intended operation in each of its operating modes. Simulate in an acceptable manner functions dependent upon parameters such as weather, process or emergency conditions which are unavailable at the time of test, or separately demonstrate when those parameters exist, to assure proper functioning under all operating conditions. Immediately after testing, properly reset control settings temporarily modified for such simulations.

- B. Final acceptance of the Work will be contingent upon the operation of all equipment and systems meeting the specified requirements.

**-END OF SECTION-**

**NO TEXT ON THIS PAGE**

**Section 16020**  
**TEMPORARY ELECTRICAL SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing a complete temporary electrical system to supply power and light as required for the construction related activities and temporary power to the existing transfer station as specified and shown. Provide a temporary electrical system that is complete and includes but is not limited to: service entrance and distribution center, conduit, wire, temporary overhead or underground extensions, grounding, lighting fixtures, panelboards and all auxiliary equipment necessary to support the construction.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods
- B. Section 16060 - Grounding
- C. Section 16121 - Wires and Cables - 600 Volts and Below
- D. Section 16130 - Electric Raceway Systems
- E. Section 01513 - Temporary Power Facilities

**1.03 REFERENCES**

- A. Codes and Standards: The following codes and standards are referred to in this Section:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code
  - 3. NESC - National Electrical Safety Code
  - 4. Local Utility Requirements
  - 5. OSHA - Occupational Safety and Health Administration Regulations

**1.04 SYSTEM DESCRIPTION**

- A. The Contractor shall make all necessary arrangements with Con Edison and shall provide a temporary electrical service point connection. Connecting lines and service supply shall be of sufficient capacity to supply all temporary light and power required on the site of the new MTS and support the continued use of the nearby existing transfer station.
- B. Arrangements shall be made with Con Edison immediately after notice to commence work.
- C. The service shall have provisions for meter connections for the Contractor and the Resident Engineer and the existing transfer station. The service shall be branched and metered using circuit breakers or fused switches and meters.

1. The distribution from the meter to the Contractor's field office and shops at the site shall be the responsibility of the Contractor.
  2. The distribution from one (1) meter to Resident Engineer's field office shall be the responsibility of the Contractor.
  3. The distribution from one (1) meter to the construction temporary light, power, and security system shall be the responsibility of the Contractor.
  4. The distribution from the meter to the existing nearby transfer station shall be the responsibility of the Contractor.
- D. The Contractor shall be responsible for making arrangements with Con Edison to have any additional meters they may require installed and for payment there for.
- E. The energy charges for the Contractor's field office and shop usage shall be the responsibility of the Contractor.
- F. Energy charges associated with the work areas general power and lighting and the security site lighting shall be the responsibility of the Contractor.
- G. Energy charges associated with the Resident Engineer's field office shall be the responsibility of the Contractor.
- H. Energy charges associated with the existing transfer station shall be billed directly to the City of New York by Con Edison. The City of New York shall pay these charges.
- I. Any additional power the Contractor requires beyond that specified herein, it shall arrange with Con Edison for such additional temporary power and light and shall bear the costs of all material and ancillary equipment necessary.
- J. Provide a portable generator for use in accordance with the requirements of Section 01513 – Temporary Power Facilities.

#### 1.05 DESIGN REQUIREMENTS

- A. The Contractor shall provide all systems and circuits in accordance with the Electrical Code of the City of New York, NFPA 70, the National Electrical Safety Code, Utility requirements, and OSHA requirements.
- B. The temporary electrical system shall be provided in accordance with the following design requirements:
1. The Contractor and the Resident Engineer trailer complex shall each have a separate branch.

2. The Contractor's branch shall supply the work area general lighting, power, and security. Receptacles (GFI type) shall be located throughout the work area. Receptacle connected equipment shall be suitable for 120-volt operation. Operating input shall not exceed 1500 volt-amperes. Illumination levels shall be as required by OSHA.
3. Security site lighting circuits shall supply a system of security lighting for the work area, field office complex(s), Contractor's staging areas, and all parking areas. Unless specifically shown otherwise on the Contract Drawings or stated in the Specifications, the system shall be arranged to provide a minimum lighting intensity of 5-foot candles in these areas.
4. A minimum of three 200 ampere meter pans and one 500 amp meter assembly and fused disconnect switches rated for 120/208 volt, 3 phase, 4 wire may be furnished, installed and wired for the above. All meters shall be paid by the Contractor. The ampacity listed is the minimum to be installed and may not meet the requirements of these specifications. The installed capacity shall meet all specified requirements.

#### 1.06 SUBMITTALS

- A. Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Product Data and Information: Furnish manufacturer's catalog data for the equipment provided for use in the Temporary Electrical System
- C. Shop Drawings: Furnish shop drawings showing the following:
  1. One-line diagram representing the power distribution for the temporary system
  2. Location plan indicating the major distribution equipment
  3. Panel loading, voltage drop, short circuit and other calculations, as required
  4. Security lighting layout

#### 1.07 QUALITY ASSURANCE

- A. The temporary general lighting system shall provide lighting for access to and egress from the work and for safe and expeditious construction within designated enclosed areas of the structure or structures.
- B. The temporary service for the existing transfer station shall provide adequate power at acceptable voltage to run that facility as the operation requires, during the construction of the new MTS. This service is not required until the work on the



water interface in the area of the new construction requires interruption of the present service.

- C. All temporary electrical system equipment and components shall be of recent manufacture and of proper working order for the intended purpose.
- D. The Contractor shall maintain in proper working order and repair the temporary electrical system.
- E. The Contractor shall modify, extend, and relocate the temporary electrical system components, as needed, to support construction activities.
- F. The Contractor shall remove the temporary electrical system when directed by the Resident Engineer.

## PART 2 PRODUCTS

### 2.01 ELECTRICAL SERVICE CONNECTION

- A. The Contractor shall provide a service entrance and distribution center at the service point. Service entrance and distribution equipment shall be in accordance with the following:
  - 1. Enclosures shall be rated NEMA 3R.
  - 2. Meter pans and assemblies shall be suitable for revenue meters of various capacities required. Meters will be furnished by the Utility.
  - 3. Circuit breakers shall be thermal magnetic type. Circuit breakers shall be equipped with lockable handles.
  - 4. Disconnect switches shall be fused type with current limiting fuses. Disconnect switches shall be equipped with padlocking features.
  - 5. All equipment shall be approved by Con Edison.
- B. The Contractor shall also provide the following other equipment at the service point:
  - 1. Eight-foot high, steel chain link fence with gate shall enclose the service entrance and distribution center. The fence shall be arranged so to permit a minimum clearance distance of 6 feet between the fence and the equipment.
  - 2. The fence shall include baked enamel, 14 by 10 inch caution signs. The signs shall read, "DANGER - HIGH VOLTAGE - KEEP - OUT". The signs shall be bolted to the fence on each side of the fence and on the main gate.

3. A 4/0 AWG ground grid consisting of four ground rods, one at each corner, shall be provided. Maximum ground resistance shall be 2 ohms. Grounding system shall be in accordance Section 16060 – Grounding.

## 2.02 RACEWAYS AND WIRING

- A. All conductors shall be 600 volt, enclosed in properly sized raceways or be routed aerially using Type AC, MC or TC cable.
- B. Conductors shall be provided for all devices, suitably sized for the intended purpose. Conductors installed in raceways shall be single conductor type THHN/THWN or equal to be approved by the Engineer and Con Edison. Armored cable, Type AC, metal-clad cable, Type MC or power and control tray cable, Type TC shall also be permitted.
- C. Raceways where used shall be suitably sized for the conductors. Raceways shall be rigid metallic type.
- D. Aerially routed cables shall be messenger supported from solid wood poles or other recognized means. Messenger shall be high strength galvanized steel.
- E. Poles shall have a class suitable for the installation in accordance with the National Electrical Safety Code and the Utility's requirements and shall be thirty feet length minimum. Poles shall be guyed at angle or corner runs and when eccentrically loaded.
- F. Underground cables shall be USE rated and suitably protected from damage during construction. This method may only be used where permitted by applicable codes and with permission of the engineer.

## 2.03 LIGHTING FIXTURES AND DEVICES

- A. Receptacles (GFI type) shall be grounded type, 120 volt, 20 ampere suitable for hand tools such as drills, hammers and grinders.
- B. General lighting lamps shall be 100 watt installed in suitable lamp holders. Security lighting lamps (outdoor) shall be 400-watt high pressure sodium installed within a floodlight type fixture suitable to illuminate the intended area.
- C. Switches, breakers and miscellaneous equipment shall be suitable for the intended purpose, with voltage, current and short circuit interrupting ratings as required for the circuits.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. The ground grid cable shall be installed in loop fashion completely around and outside the service point fence. The fence and distribution equipment shall be connected to the grid at a minimum of two locations.
- B. The temporary general lighting system shall be installed progressively in structures as the designated areas are enclosed or as lighting becomes necessary because of partial enclosure. Lamps shall be installed to provide an even distribution of illumination over the work areas.
- C. Receptacles shall be installed in such a manner so as to reach any point in the work areas with an extension cord not to exceed 40 feet in length.
- D. Security lighting shall be installed on poles to illuminate the staging, outdoor and parking areas.
- E. Aerial conductors shall be installed at a minimum height of 14 feet above finished grade. When conductors cannot be routed at the proper height or where it will interfere with plant operations or construction activities, conductors shall be provided in rigid steel conduit and installed underground.

**3.02 OPERATION**

- A. The Contractor shall keep the temporary power and lighting system alive in accordance with Section 01513 - Temporary Power Facilities.

**3.03 MAINTENANCE**

- A. The temporary electrical system shall be maintained and repaired until it is no longer required.
- B. Lamps, fuses and other equipment shall be repaired and/or replaced, as required.

**3.04 REMOVAL**

- A. At the conclusion of the work, when directed by the Resident Engineer, the temporary system shall be removed in its entirety. The ground surfaces and structures disturbed by the work shall be restored to their original condition.

-END OF SECTION-

**Section 16050**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General requirements for providing basic electrical materials and methods.
- B. Related Work Specified in Other Sections Includes:
  - 1. Certain equipment, control devices, conduit and wiring shown on electrical drawings, but are specified in other sections pertaining to plumbing, heating, ventilating, air conditioning, temperature control systems, process equipment, process control systems, instrumentation, fire suppression, fire alarm, heat trace, impressed current Cathodic protection and other non-Division 16 portions of the specifications. Install and connect these items to the electrical system as indicated or required in accordance with the Contract Documents.
- C. Overall Application of Specifications: This Section applies to all Division 16 sections and to other sections that include requirements for electrical equipment. Irrespective of where the electrical requirements are specified, provide and install all materials necessary for a complete operational system.
- D. Temporary Requirements: This Section applies to any temporary circuits, overcurrent devices, conduit, wiring, and other equipment required during changeover from the existing electrical system to a new electrical system. This Section also applies to temporary rewiring of lighting circuits, power circuits, instruments and devices.

**1.02 DEFINITIONS**

- A. Corrosive Areas: The following areas are designated corrosive areas:
  - 1. Tipping Floor
  - 2. Loading Floor
  - 3. Lidding Area
  - 4. Container Loading Area
  - 5. Vehicle Maintenance Room
  - 6. Outdoors at Pier Level
  - 7. Ramps
  - 8. Odor Control Room
  - 9. Mechanical Mezzanine
  - 10. Outdoor area around fuel and oil storage tanks, fill ports and the Engine-Generator enclosure.
  - 11. Outdoor under the Pier Level Floor Slab.

- B. Architectural Finished Areas: The following areas are designated as architectural finished areas:
  - 1. Offices
  - 2. Personnel Areas
  - 3. Control Rooms
- C. Hazardous Area Classification.
  - 1. Fueling Station
  - 2. Fuel Port

### 1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Product Data and Information: Furnish a complete list of electrical equipment and materials to be furnished that shows the manufacturer, catalog number, size, type, capacity, voltage rating and other pertinent information related to each item on the list.
  - 1. Furnish catalog data on the manufacturer's standard equipment and materials. Clearly indicate on the catalog data the equipment and devices specifically being proposed.
  - 2. Identification: Furnish a complete schedule or listing of system and equipment identification labels with legends.
- C. Contractor's Shop Drawings: Furnish shop drawings on items manufactured for the Contract or systems – Security (CCTV, Access Control), Telephone/Data, Paging, Fire Detection and Alarm, etc. – supplied for this contract..
  - 1. Furnish a connection diagram and schematic for each piece of electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one method of wiring is not acceptable unless, the intended method is clearly marked.
  - 2. Furnish diagram that show connections to field equipment. Clearly differentiate between manufacturer's wiring and field wiring.
  - 3. Furnish raceway layout drawings that show conduits, boxes, and panels which contain the conductors to be provided. Include schedules listing conduit sizes and conductor content and identification.

4. Where additions and modifications are made to existing equipment, furnish drawings which clearly identify the existing equipment that remains and the new Work.
- D. Coordination Drawings: Furnish coordination drawings that have a scale of 1/4"=1'-0" or larger; that show major elements, components, and systems of electrical equipment as they relate to other systems, installations, and building components. Indicate locations where access space is limited and where sequencing and coordination of installations are required for the efficient flow of the Work, including (but not limited to) the following:
1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
    - a. Clearances for servicing equipment, including space for equipment disassembly as required for periodic maintenance
    - b. Exterior wall and foundation penetrations
    - c. Fire-rated wall and floor penetrations
    - d. Equipment connections and support details
    - e. Sizes and location of required concrete pads and bases
  2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  4. Prepare reflected ceiling plans to coordinate the installation of air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.
- E. Record Documents: Furnish record documents, and in addition to the requirements specified in Division 1, indicate installed conditions for:
1. Interior and exterior major raceway systems' sizes and locations; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker sizes and arrangements
  2. Exposed and concealed equipment locations dimensioned from prominent building lines
  3. Approved substitutions, and actual equipment and materials installed

F. Maintenance Manuals: Furnish maintenance manuals, and in addition to the requirements specified in Section 01831, include the following information for equipment items:

1. Functional description, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and catalog numbers of replacement parts
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions
4. Servicing instructions and lubrication charts and schedules

#### 1.04 QUALITY ASSURANCE

- A. Codes: Provide all electrical Work in accordance with applicable local codes, regulations and ordinances. If there is a conflict between the requirements specified in the Contract Documents and the codes, follow the more stringent requirements as determined and approved.
- B. Testing: As a minimum, provide standard factory and field tests for each type of equipment. Other tests may be specified in the applicable equipment section.
- C. Labeling: Provide electrical equipment and materials that are listed and approved by Underwriters Laboratories or other OSHA recognized testing laboratories with the testing agency's label attached.
- D. Standard Products: Unless otherwise indicated, provide electrical materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to these Specifications. Provide the products of the same manufacturer when two or more units of the same class of material and equipment are required.
- E. Seismic Testing: All equipment shall conform to seismic requirements of the NYCBC.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows.

- B. Shipping and Packing: Provide materials and equipment suitably boxed, crated or otherwise completely enclosed and protected during shipment, handling, and storage. Clearly label such boxes, crates or enclosures with manufacturer's name, and name of material or equipment enclosed.
- C. Acceptance at Site: Conform to acceptance requirements described in Division 1.
  - 1. Repair or replace all materials and equipment damaged by handling and storage as directed at no additional cost to the City.
- D. Storage and Protection: Protect materials and equipment from exposure to the elements and keep them dry at all times. Handle and store to prevent damage and deterioration in accordance with manufacturer's recommendations.

#### 1.06 PROJECT CONDITIONS

- A. General: The Contract Drawings indicate the extent and general arrangement of the principal electrical elements, outlets, devices and circuit layouts. Install and connect all electrical elements and devices to form a complete workable system as required by the Contract Documents, regardless of whether all system components are specifically stated in the Specifications or shown. Provide necessary materials and installation wherever required to conform to the specific requirements of the furnished equipment and for proper installation of the Work.
- B. Schematics: In general the runs of feeders are shown schematically and are not intended to show exact routing and locations of raceways. Verify actual and final arrangement, equipment locations, and prepare circuit and raceway layouts before ordering materials and equipment. Equipment locations are approximate and are subject to modifications as determined by approved equipment dimensions.
- C. Coordination of Work: Coordinate the Work so that the electrical equipment may be installed without altering building components, other equipment or installations.
- D. Departure from Design: If departures are deemed necessary due to structural conditions, obstructions or other problems, provide details of such departures and the reasons for requesting approval as soon as practicable but not later than the submittal of the raceway layout drawings. Do not make any departures without written approval.

#### PART 2 PRODUCTS (Not Used)

#### PART 3 EXECUTION

##### 3.01 ROUGH-IN

- A. Final Location: Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.



### 3.02 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by making field measurements.
3. Arrange for chases, slots, and openings in other building components as construction progresses to provide for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in cast-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum possible headroom.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide all required connections for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Drawings, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer for resolution.
9. Where installed exposed in finished spaces, install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
10. Provide electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Provide access panels or doors where units are concealed behind finished surfaces.

12. Install systems, materials, and equipment providing right-of-way priority to systems required to be installed at a specified slope.
13. Certain 120/240 volt or 277 volt equipment, including receptacles, single phase motors, lighting and controls as well as low voltage communication/paging, security, fire detection and alarm systems – do not indicate raceways connecting them to other equipment of the same type or system or to the source of service. This is to permit the Contractor to supply their experience and ingenuity in routing same – within the guidelines presented in various sections of these specifications and the applicable codes.

### 3.03 CUTTING AND PATCHING

- A. General: Perform cutting and patching as specified in Division 1. In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
  - a. Uncover Work to provide for installation of ill-timed Work.
  - b. Remove and replace defective Work.
  - c. Remove and replace Work not conforming to requirements of the Contract Documents.
  - d. Remove samples of installed Work as specified for testing.
  - e. Install equipment and materials in existing structures.
  - f. Locate existing structural reinforcing with a pachometer where core drilled penetrations are required so as not to cut the steel reinforcing.
2. Cut, remove, and properly dispose of selected electrical equipment, components, and materials as indicated. Included are the removal of electrical items indicated to be removed and items made obsolete by the new Work. Deliver all removed serviceable apparatus to the City as directed.
3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
4. Provide and maintain adequate temporary partitions or dust barriers that prevent the spread of dust and dirt to adjacent areas.
5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

6. Patch finished surfaces and building components using new materials that are compatible with the original installation and applied by experienced installers.

**-END OF SECTION-**

**Section 16055****ELECTRICAL REQUIREMENTS FOR SHOP-ASSEMBLED EQUIPMENT****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for furnishing, installing and testing shop-assembled equipment as indicated, in accordance with the Contract Documents. Shop-assembled equipment panels and other items are specified under the driven equipment sections and may require external field connection to ancillary devices and other system components for interlocks and alarms. Provide all field wiring as required by the system and equipment specified under the driven equipment sections. This field wiring may not be specified or shown. This equipment includes but is not limited to the following:

1. Air Compressors
2. Air conditioning units
3. Air monitoring equipment
4. Booster Pumps
5. Container Lidding system
6. Constant tension mooring winches
7. Electric hoists and cranes
8. Electrical Heat Trace system
9. Electric water coolers
10. Fire Pump and related equipment
11. Fan equipment
12. Dust suppression system
13. Fuel Dispensing, Monitoring, Distribution and Storage System.
14. Fluids Dispensing, Monitoring and Storage System.
15. Miscellaneous control equipment
16. Mooring capstans
17. Odor control equipment
18. Overhead doors
19. Pump equipment
20. SCADA System
21. Service water system
22. Sewage Pumps
23. Sump pump equipment
24. Temperature control systems
25. Scales and related equipment.

**1.02 RELATED SPECIFICATIONS**

- A. Section 07721 - Roof Hatches
- B. Section 08331 - Overhead Coiling Doors
- C. Section 08342 - Overhead High Speed Fabric Doors
- D. Section 09912 - Interior Painting

- E. Section 10881 - Vehicle Scales
- F. Section 11211 - Service Water System
- G. Section 11377 - Compressed Air Equipment
- H. Section 11570 - Dust Suppression System
- I. Section 13861 - Odor Control System
- J. Section 11141 - Diesel Fuel Dispensing System
- K. Section 11142 - Fluid Dispensing System
- L. Section 14601 - Container Lidding System
- M. Section 14695 - Constant Tension Mooring Winches
- N. Section 14696 - Mooring Capstans
- O. Section 15058 - Hose Reel Assemblies
- P. Section 15771 - Electric Heat Tracing Systems
- Q. Section 11140 - Vehicle Exhaust System
- R. Section 13921 - Electric Drive, Centrifugal Fire Pumps
- S. Section 15412 - Emergency Plumbing Fixtures
- T. Section 15415 - Water Coolers
- U. Section 15444 - Package Booster Pumps
- V. Section 15445 - Sewage Pumps
- W. Section 15486 - Domestic Water Heaters
- X. Section 15446 - Sump Pumps
- Y. Section 15551 - Chimney Automation System
- Z. Section 15670 - Condensing Units
- AA. Section 15720 - Air Handling Units
- BB. Section 15730 - Packaged Air Conditioning Units
- CC. Section 15820 - Ductwork Accessories
- DD. Section 15830 - Fans
- EE. Section 15900 - HVAC Controls
- FF. Section 15946 - Air Monitoring
- GG. Section 16050 - Basic Electrical Materials and Methods
- HH. Section 16060 - Grounding
- II. Section 16075 - Electrical Identification
- JJ. Section 16085 - Short Circuit and Coordination Study
- KK. Section 16121 - Wires and Cables - 600 Volts and Below
- LL. Section 16130 - Electrical Raceway System
- MM. Section 16140 - Wiring Devices
- NN. Section 16220 - Electric Motors
- OO. Section 16266 - Adjustable Frequency Drives
- PP. Section 16415 - Automatic Transfer Switches
- QQ. Section 16460 - General Purpose Dry Type Transformers
- RR. Section 16491 - Control Components and Devices

### 1.03 REFERENCES

- A. Codes and standards referred to in this Section are:

- 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
3. NEC - National Electrical Code
4. NYCBC - New York City Building Code
5. UL-508A - Industrial Control Panels
6. NEC-409 - Industrial Control Panels

#### 1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Provide the Shop Assembled equipment using the components and appurtenances meeting the requirements specified in Division 16.

#### 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.
- C. Shop Drawings: Furnish shop drawings for the shop-assembled equipment, including the following:
1. Layout drawings of the assembly showing accurately scaled basic equipment sections, auxiliary compartments and combination sections. Show special relationships of assemblies to associated equipment, including plan and front views of the equipment. Furnish a device summary.
  2. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions.
  3. Furnish construction drawings for equipment requiring field assembly. Clearly differentiate between shop-assembled portions and field-assembled portions.
  4. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.
- D. Quality Control: Furnish manufacturer's test reports and certified performance records of all equipment installed. Furnish field test reports after equipment is installed.

## 1.06 QUALITY ASSURANCE

- A. Codes: Comply with local codes and all other applicable codes.
- B. Regulatory Requirements: Comply with applicable Regulatory Agency requirements.

## PART 2 PRODUCTS

## 2.01 FABRICATION

- A. General: Provide shop-assembled equipment as standard products manufactured by companies regularly engaged in the manufacture of such equipment.
- B. Factory Assembled Requirements: Provide control panels for shop-assembled equipment as complete factory assembled units that require only external connections for installation including main disconnect and all electrical features necessary for the proper operation of the units.

## C. Controls

## 1. Motors 1/2 Hp and Larger

- a. Provide motors suitable for 480-volt, 3-phase, 60-hertz operation, with all controls at 115 volts or less.
- b. Provide a combination circuit breaker along with all required control transformers, relays, timers, heaters and other necessary incidentals to form a complete functioning unit.
- c. Provide NEMA Size 1 or larger starters.

## 2. Motors less than 1/2 Hp

- a. Provide motors suitable for 120-volt, single-phase operation.
- b. Provide manual motor starter with neon pilot light.

## 3. Provide all controls and equipment as specified in Section 16491 – Control Components and Devices.

- D. Control Components: Install principal control components in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Above grade indoor	NEMA 12 - Industrial
Outdoor and below grade elevation indoor	NEMA 4 - Watertight
Corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown.	NEMA 4X - Watertight and corrosion-resistant stainless steel with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures

E. Miscellaneous Controls

1. Provide float switches, pressure switches, limit switches, thermostats and other auxiliary control devices to satisfy the intended service.
2. Provide contacts rated at 10-amperes, 120 volts, 60-hertz ac, unless otherwise specified.
3. Provide limit switches that function in accordance with contact development charts.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install shop-assembled equipment as indicated, in accordance with manufacturer's written instructions.
- B. Coordination: Coordinate cabling and wiring as necessary to interface installation of shop-assembled equipment.
- C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.
- D. Grounding Connections: Make equipment grounding connections for the shop-assembled equipment as specified and shown. Tighten connections in accordance with UL Standard 486A to assure permanent and effective grounding.



- E. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.

3.02 PAINTING

- A. Shop Painting: Paint the shop-assembled equipment enclosures as specified in Section 09912 - Interior Painting.
- B. Field Painting: Clean and touch up scratched and marred surfaces to match original finish.

-END OF SECTION-

## Section 16060 GROUNDING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes: Requirements for providing a complete grounding system as specified and shown. Grounding includes but is not limited to: electrical equipment enclosures, transformers, switchgear, motor control centers, electrical generators and derived system neutrals, ground grid systems, grounding rods, grounding conductors, bonding jumpers, waterpipe connections and structural metal frames and members as required.

#### 1.02 RELATED SPECIFICATIONS

- A. Section 13100 - Lightning Protection Systems
- B. Section 16050 - Basic Electrical Materials and Methods
- C. Section 16080 - Electrical Testing Requirements
- D. Section 16121 - Wires and Cables - 600 Volts and Below
- E. Section 16130 - Electrical Raceway Systems

#### 1.03 REFERENCES

- A. Codes and Standards: The following codes and standards are referred to in this Section:
  - 1. NEC - National Electrical Code
  - 2. NYCEC - Electrical Code for the City of New York
  - 3. UL-96A - Installation Requirements for Lightning Protection Systems

#### 1.04 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Furnish manufacturer's catalog data for the following:
  - 1. Grounding and grounded conductors
  - 2. Grounding connectors, clamps and bushings
  - 3. Grounding rods
  - 4. Bonding jumpers
  - 5. Thermite Welding Products
- C. Shop Drawings: Furnish shop drawings showing the locations and length of grounding rods. Label the size and material used for grounding rods. Furnish details pertaining to grounding electrode conductors, grounding and grounded

conductors, grounding connections and the ground grid for buildings, structures, lighting units, manholes and handholes.

- D. Quality Control: Furnish a field report of the system ground impedance test results.

## 1.05 QUALITY ASSURANCE

- A. Codes and Standards: Construct a complete grounding system in accordance with applicable ANSI, IEEE Standards and the Electrical Code for the City of New York, NEC.UL-96A and local codes.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

#### 1. Grounding and Grounded Conductors

- a. Southwire
- b. United Copper Industries

#### 2. Ground Plates

- a. Burndy Corporation
- b. OZ/Gedney Company
- c. Erico Products
- d. Thomas & Betts

#### 3. Grounding Rods

- a. Harger Lightning Protection, Inc.
- b. Thomson Industries, Inc.
- c. Carolina Galvanizing Utility Products Division
- d. Erico Products
- e. Superior Grounding Systems

#### 4. Ground Rod Access Box

- a. Strongwell – Quazite
- b. Hartford Concrete Products, Inc.

### 2.02 MATERIALS

- A. General: Provide conductor sizes as shown or required.

- B. Materials: Provide conductors in accordance with the requirements specified in Section 16121 - Wires and Cables - 600 Volts and Below.
- C. Bare Conductors: Provide bare copper conductor where buried in earth, embedded in concrete or exposed.
- D. Insulated Conductors: Provide copper conductor with green color insulation rated at 600 volts where installed in conduits or other enclosed raceways.

## 2.03 CONNECTORS

- A. Grounding Clamps and Bolted Connectors: Provide grounding clamps and bolted connectors suitable for devices or cables being connected.
- B. Ground Plates: Provide two-hole, cast, copper alloy, ground plates suitable for installation in concrete. Fabricate the ground plates with two ½-inch diameter threaded holes and a 4/0 stud for connection to the grounding system.
- C. Welding: Provide the exothermic welding process for buried, concealed and accessible connections to structural members, ground rods, and case grounds. Clean and paint welds embedded in the ground or encased in concrete with asphalt base paint.
- D. Bolted Connectors: Provide bolted connectors for grounding to ground buses and equipment.
- E. Pipe Grounding: Provide copper, brass, or bronze grounding clamps for grounding pipes. Do not provide strap type clamps.
- F. Grounding Bushings: Provide grounding bushings for conduits where conduits are not effectively grounded by firm contact to the grounded enclosure and where the raceway is required to be bonded at both ends.

## 2.04 GROUNDING RODS

- A. Length and Size: Provide grounding rods 3/4-inch in diameter and 10 feet long.
- B. Grounding Rod Material: Stainless steel.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General
  - 1. Install conductors to preclude exposure to physical damage.
  - 2. Install connections firm and tight.

3. Arrange conductors and connectors without placing strain on the connections.
4. Bury equipment grounding conductors as shown, or at a minimum of 12 inches below grade.
5. Bring loops or taps up for connection to equipment or other items to be grounded.
6. Install an insulated grounding conductor in all conduits.
7. When raceways are used to contain and protect grounding conductors, install in accordance with Section 16130- Electrical Raceway Systems of the Electrical Contract, Electrical Code for the City of New York and NEC.
8. Where conductors are installed in nonmetallic raceway, provide the grounding conductor in addition to the neutral wire, sized in accordance with Electrical Code for the City of New York and NEC or as scheduled.
9. Perform exothermic welding with properly sized molds and in strict compliance with the manufacturer's instructions.
10. All concealed ground connections not subject to inspection or test shall be made with exothermic welds.

**B. Grounding Rod Installation**

1. Install grounding rods as shown with the top of the rod a minimum of 12 inches below grade.
2. Drive grounding rods into permanently moist soil.
3. Provide additional ground rod sections as required to reach permanently moist soil.
4. Provide cast iron junction box without bottom for access to grounding rod and conductor where shown.

**C. Equipment Grounding**

1. Ground each piece of electrical equipment using a conductor in the raceway feeding the equipment in accordance with Electrical Code for the City of New York and NEC.
2. Unless specified otherwise, connect transformer enclosures and neutrals to the grounding system. Connect the neutral ground connection at the transformer terminal. Make the connection from the ground grid to the

ground bus and enclosures of switchgears and motor control centers, lighting and distribution panelboards, and control, relay and instrumentation panels.

3. Provide two separate, independent, diagonally opposite connections for power transformers so removal of one connection will not impair continuity of the ground system. Provide ground plates that are imbedded in the concrete pad so that transformers can be removed without damaging grounding system. Install a copper ground connect between ground plates and the transformers.
  4. Connect the Engine Generator neutral and the enclosure to the enclosure ground bus and to a ground electrode.
- D. Grounding Conductors: Connect the grounding conductor between the equipment and the grounding system. Where a ground bar is furnished with the panelboard, connect the grounding conductor to the bar.
- E. Miscellaneous Grounding: Provide grounding for the following:
1. Ground receptacles and switches and their metal plates through positive ground connection to the yoke/strap, outlet box and grounding system grounding wire installed in the conduit.
  2. Ground racks, supports, frames, covers and metal parts in manholes or handholes, controllers, motor frames, surge capacitors, arrestors, lighting fixtures, metal structures (including fences), exposed noncurrent carrying metal, mechanical equipment, hoist beams, cranes and similar items.
  3. Provide ground connections to equipment using ground plates imbedded in the concrete pad so that the equipment can be removed without damaging grounding system. Provide a copper ground connection between ground plates and the equipment.

### 3.02 FIELD QUALITY CONTROL

- A. Tests: Conduct a witnessed test to determine the ground impedance for the entire system using a ground loop impedance tester. Provide a maximum impedance of 2 ohms at any point of the test. Add additional grounding rods if necessary to meet this requirement.

-END OF SECTION-

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**Section 16071**  
**SUPPORTING DEVICES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for providing supporting devices for electrical equipment and raceways in accordance with the Contract Documents. The supporting devices shall be a complete system for the equipment. The work shall include providing all required support devices to properly mount and secure all equipment furnished under this Contract. This section also includes equipment anchorage and restraints suitable to meet the specified seismic requirements.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods  
B. Section 16130 - Electric Raceway System  
C. Section 16210 - Electric Services

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
1. ASTM A569 - Specification for Steel, Carbon, Hot-Rolled Sheet and Strip Commercial Quality
  2. ASTM A570 - Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
  3. ASTM B633 - Specification for Electrodeposited Coatings of Zinc On Iron and Steel
  4. AISI - Standard for Stainless Steel
  5. MFMA-1 - Standard Publication for Metal Framing
  6. ANSI/NFPA 70 - National Electrical Code
  7. NYCBC - New York City Building Code

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.



- B. Product Data: Furnish manufacturer's catalog cuts for the supporting devices proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.
- C. Working Drawings: Furnish scaled working drawings showing dimensions and locations of all items and clearance requirements.

#### 1.05 QUALITY ASSURANCE

- A. Codes: Provide all materials and workmanship to meet the requirements of the NYCBC and ANSI/NFPA 70 National Electrical Code.
- B. Regulatory Requirements: Provide UL listed components.
- C. Design Standard: Design all support devices as follows:
  - 1. All channels, fittings and hardware used in the supporting system shall be in accordance with MFMA-1.
  - 2. The design of the support system shall be the responsibility of the Contractor. The Contractor shall provide the proper sized rods, channels, fittings, brackets and appurtenances necessary to adequately support the equipment.
  - 3. Quality Control: Furnish a signed and sealed certification from a Professional Engineer registered in New York stating that the design calculations and drawings for the support details for equipment exceeding 50 pounds in weight were prepared by that Professional Engineer or under his direct supervision.
- D. Seismic requirements: Provide support devices designed for following seismic requirements:
  - 1. Equipment assemblies such as secondary unit substations, switchgear, motor control centers and panelboards shall be certified to meet seismic requirements in accordance with the requirements specified in the applicable sections of the Specifications.
  - 2. The Contractor shall provide equipment anchorage details for all equipment certified to meet seismic requirements. The details shall be coordinated with the manufacturer's equipment mounting provisions.
  - 3. Electric conduit shall include seismic restraints.
- E. Quality Control: Furnish a signed and sealed certification from a Professional Engineer registered in New York stating that the design calculations and drawings for the seismic anchorage and restraint details were prepared by that Professional Engineer or under his direct supervision.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Allied Tube and Conduit
2. B-Line Systems, Inc.
3. Kindorf
4. Enduro
5. Strut Tech
6. Unistrut

### 2.02 CHANNELS, FITTINGS AND BRACKETS

- A. Provide channels, fittings, brackets and related hardware for mounting and supporting the electrical equipment. Anchor bolts, concrete inserts and related hardware for proper support of equipment shall also be provided. All equipment necessary to meet the seismic requirements specified shall be provided.
- B. Provide channels conforming to ASTM A569 or A570. Channels shall have a minimum thickness of 12-gauge. The cross sectional width dimension shall be 1-1/2 inch minimum. The depth shall be as required to satisfy load requirements but not less than 1-1/2 inch.
- C. Provide factory punched attachment holes, when required, on hole centers approximately equal to the cross sectional width and 9/16-inch diameter.
- D. Provide fittings and brackets having 9/16-inch diameter holes on centers identical to the channel or as required to align with the channel holes. Provide fittings and brackets having the same width as the channel and shall be 1/4 inch thick minimum. Provide fittings and brackets that mates properly with the channel.
- E. Provide all channels, fittings, brackets and related hardware manufactured from steel and having an electro-plated zinc finish according to ASTM B633.
- F. In corrosive areas, provide type 316 stainless steel or PVC coated channels, fittings, brackets and related hardware.

### 2.03 CONDUIT HANGERS, SUPPORTS AND INSERTS

- A. Provide channels, rods, straps, anchors and related hardware for support of the exposed electric conduit system as specified in Section 16130 – Electric Raceway System.
- B. Provide anchor bolts, concrete inserts and related hardware for proper support of equipment. Provide all equipment necessary to meet the seismic requirements.

- C. Provide conduit hangers, supports and inserts in accordance with Section 16130 - Electric Raceway System.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Provide all supporting devices installed level, parallel and perpendicular to building walls and floors, such that the support system is installed in a neat and professional manner.
- B. Provide all holes in hung ceilings for support rods and other equipment made adjacent to bars where possible, to facilitate removal of ceiling panels.
- C. Provide channels, fittings and brackets that are rigidly bolted together and braced to make a substantial supporting framework support system.
- D. Where motor control centers, switchgear, unit substations and other electrical equipment are being installed on concrete pads, furnish leveling channels for installation in the concrete pads. Anchor seismic certified equipment in accordance with the seismic anchorage details.
- E. Provide all equipment fastenings to steel columns, beams and trusses by beam clamps. In lieu of beam clamps, equipment may be welded to steel structures, subject to Engineer approval.
- F. Do not drill holes in any steel columns, beams and trusses.
- G. Provide hanger rod supports installed such that threaded rod is parallel and perpendicular to building walls and floors.
- H. When galvanized steel channel is cut in the field, the cut ends shall be treated with a rust preventative to retard corrosion.

-END OF SECTION-

**Section 16075**  
**ELECTRICAL IDENTIFICATION**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Requirements for providing materials for the identification of electrical equipment, components, conduits, cables and wiring, and furnishing and installing safety signs.

**1.02 REFERENCES**

- A. Codes and standards referred to in this Section are:
1. ANSI C2 - National Electrical Safety Code (NESC)
  2. ANSI Z535.1 - Safety Color Code
  3. ANSI Z535.2 - Environmental and Facility Safety Signs
  4. ANSI Z535.3 - Criteria for Safety Symbols
  5. OSHA - Occupational Safety and Health Act
  6. OTCR - Office Technical Certification and Research
  7. NYCEC - New York City Electrical Code

**1.03 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1.
- B. Product Data and Information: Furnish manufacturer's catalog data for safety signs, nameplates, labels and markers.
1. Furnish manufacturer's instructions indicating application conditions and limitations of use; and storage, handling, protection, examination and installation of product.
- C. Contractor's Record Drawings: Furnish Contractor's Record Drawings accurately showing actual location of markers for underground ducts, handholes and manholes, at completion of the Project.

**1.04 SPARE PARTS**

- A. Furnish the following spare parts.
1. Ten safety signs of each size and wording.
- B. Packaging: Package spare parts in containers bearing labels clearly designating contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory packages.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. W. H. Brady Company
2. Seton
3. Thomas & Betts

## 2.02 MATERIALS AND COMPONENTS

- A. General: Provide identification materials listed and classified by OTCR, UL or tested by an acceptable Electrical Testing Company certifying the equivalence of the materials to UL listing requirements and OSHA approved.

- B. Laminated Plastic Nameplates: Provide engraved three-layer laminated plastic nameplates with black letters on white background and fastened with corrosion-resistant screws. Do not use mounting cement for fastening nameplates.

1. Provide nameplates with 1-inch high lettering for switchgears, switchboards, motor control centers, control panels, relay panels, contactor panels, panelboards, and similarly grouped equipment, transformers and disconnect switches.
2. Provide nameplates with ½-inch high lettering for individual components of a group such as main breakers, switchgear units, switchboard units, motor control center units and similar devices.
3. Provide nameplates with ¼-inch high lettering for remote motor controllers, control stations, relays and similar equipment.
4. Provide nameplates for each motor identifying service or function and lettering of an appropriate size to suit each motor.
5. Provide approved laminated directories of circuits with typewritten designations of each branch circuit in each panelboard.
6. Provide smaller lettering for a neat, legible nameplate where the amount of lettering makes for excessively large nameplates.

- C. Wire Markers: Identify wire bundles and each individual wire.

1. Wire bundles: Provide a brass or rigid fiber identifying tag attached with nylon self locking "Ty-Raps".

2. Wire identification markers: Provide a printed white, heat-shrink, seamless tubing type with black bold lettering for wires size No. 10 AWG and smaller. Provide a printed self-laminating white, vinyl type with black bold lettering for wires No. 8 AWG and larger.
- D. Safety Signs: Provide safety signs in accordance with OSHA standard meeting the requirements of ANSI C2, ANSI Z535.1, ANSI Z535.2 and ANSI Z535.3.
1. Provide safety signs manufactured from vinyl having a minimum thickness of 60 mils with red and black letters and graphics on a white background.
  2. Size: 10 inches by 14 inches except signs 7-inch by 10-inch may be provided where the larger size cannot be applied.
  3. Mount safety signs using corrosion-resistant screws. Do not use mounting cement.
- E. Arc Flash: Provide Arc Flash Hazard Tags of the type required by NFPA 110.16.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Surface Preparation: Degrease and clean surfaces to receive nameplates, labels and marking paint.

#### 3.02 INSTALLATION

- A. General: Install nameplates on the front of equipment, parallel to the equipment lines and secured with corrosion resistant screws.
1. Install laminated nameplates identifying:
    - a. Each electrical equipment enclosure
    - b. Individual equipment and devices
- B. Wire Markers: Identify wire bundles and each individual wire with identification tags as follows:
1. Wire Bundles: Install an identifying tag engraved with the conduit number where conduits enter motor control centers, switchgear, switchboards, control panels, terminal boxes and the like.
  2. Wire identification markers: Provide wire identification markers on each wire at all termination points.
    - a. On power and lighting circuits: The branch circuit or feeder number as indicated on Contract Drawings

- b. On control circuits terminated in motor control centers, switchgears, control panels and alike: The field device and terminal number of the opposite end connection.
    - c. On control circuits at each field device: The panel or compartment number and terminal number of the opposite end connection.
  - 3. Oversize wire markers so that after heat shrinking the wire marker can be rotated on the wire. Rotate wire markers so that wire identification number is visible.
- C. Safety Signs: Provide safety signs as follows or as shown:
  - 1. Type DS-1
    - a. Wording: "DANGER - BATTERY CHARGING AREA, NO SMOKING"
    - b. Location: Within 3 feet of all battery racks.
  - 2. Type DS-2
    - a. Wording: "DANGER - ELECTRICAL EQUIPMENT, AUTHORIZED PERSONNEL ONLY"
    - b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment.
  - 3. Type DS-3
    - a. Wording: "DANGER - HIGH VOLTAGE, KEEP OUT"
    - b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment operating at over 600 Volts. Also, on the sides of fences or walls which enclose outdoor equipment operating at over 600 Volts.
  - 4. Type DS-4
    - a. Wording: "DANGER - HIGH VOLTAGE"
    - b. Location: Outside all equipment operating at over 600 Volts.
  - 5. Type DS-5
    - a. Wording: "DANGER - POWERED FROM MORE THAN ONE SOURCE"

- b. Location: Outside all equipment that operates from more than one power source.
- 6. Type DS-6
  - a. Wording: "NOTICE - KEEP DOOR CLOSED"
  - b. Location: On all doors with another safety sign installed.
- 7. Type DS-7
  - a. Wording: "CAUTION - CONTROLS & INTERLOCKS POWERED FROM MULTIPLE SOURCES"
  - b. Location: On all control panel doors.
- 8. Arc Flash: Provide Arc Flash Hazard Tags of the type required by NFPA 70 110.16

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 16080**  
**ELECTRICAL TESTING REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements of field acceptance testing of materials and equipment provided under various other sections to determine suitability for installation and energization. Requirements of field testing and certification of electrical equipment and materials provided under various other sections to assess their meeting the requirements of the City of New York and equivalence to UL Inc. listing/labeling.

**1.02 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NETA - International Electrical Testing Association
2. NIST - National Institute of Standards and Technology
3. OTCR- Office of Technical Certification and Research
4. NYCBC - New York City Building Code

**1.03 SUBMITTALS**

- A. General: Furnish all submittals including the following, as specified in Section - 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.

1. Acceptance Testing Reports: Furnish acceptance testing reports for all equipment and materials including the following information:
  - a. Summary of the test
  - b. Description of material or equipment tested
  - c. Description of test including acceptable test values
  - d. Test results
  - e. Analysis of test results with recommendations
2. UL Testing: Furnish standard test parameters in accordance with the acceptable codes and standards for all the equipment and materials tested for equivalence to UL listing.
3. UL Test Reports and Certificates: Furnish test reports and certificates for all equipment and materials tested for equivalence to UL listing, for approval.
4. All submittals shall comply with the requirements of the OTCR.

## PART 2 PRODUCTS

### 2.01 TESTING COMPANIES

A. Acceptable testing companies are as listed below:

1. MET Electrical Testing Co., Inc.
2. ASET Power Systems Services, Inc.
3. Electric Power Systems, Inc.
4. Electro-Test, Inc.
5. High Voltage Maintenance Corp.
6. UL Underwriters Laboratories, Inc.
7. Other OTCR, OSHA and NETA approved testing facilities

### 2.02 SOURCE QUALITY CONTROL

- A. Tests: Furnish all testing and certification in accordance with the latest NETA, ANSI, IEEE and NEMA Standards to meet the UL requirements, NFPA Standards, OTCR, NYCBC and NEC.
- B. Test Equipment: Furnish all testing equipment, cables and appurtenances required to perform all tests and certifications in accordance with the following:
1. Use instruments that have been calibrated, to assure that they are within rated accuracy in accordance with NIST.
  2. Select test instruments that are appropriate for the variable being measured.

## PART 3 EXECUTION

### 3.01 TESTING AND CERTIFICATION

- A. Furnish the test reports and certifications for UL equivalence prior to acceptance of all materials and equipment requiring such tests and certifications.
- B. All materials that require acceptance shall be subject to the OTCR procedures and processes.

### 3.02 ACCEPTANCE TESTING

- A. Furnish acceptance test reports prior to acceptance of all materials, equipment and installations requiring such tests.

-END OF SECTION-

**Section 16085**  
**SHORT CIRCUIT AND COORDINATION STUDY**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Short circuit and coordination study for the entire power distribution system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16080 - Electrical Testing Requirements
- B. Section 16210 - Electric Service
- C. Section 16220 - Electric Motors
- D. Section 16230 - Packaged Engine Generator Systems
- E. Section 16411 - Disconnect Switches
- F. Section 16430 - 480 Volt Switchgear
- G. Section 16445 - Motor Control Centers
- H. Section 16443 - Panelboards
- I. Section 16415 - Automatic Transfer Switches
- J. Section 16491 - Control Components and Devices

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. IEEE 242, "IEEE Recommended Practices for Protection and Coordination of Industrial and Commercial Power Systems"
  - 2. IEEE 399, "IEEE Recommended Practices for Industrial and Commercial Power Systems Analysis"
  - 3. NEC - National Electrical Code
  - 4. NYCBC - New York City Building Code

**1.04 SYSTEM DESCRIPTION**

- A. Furnish a short circuit and coordination study for the entire distribution system. Include the following in the short circuit study:
  - 1. One-line diagram of the entire distribution system identifying all components considered and ratings of all power devices. Use ANSI device numbers to identify all protective devices.
  - 2. Calculation of momentary and interrupting fault duties for each bus.

3. Calculation of bus-to-bus impedance values reduced to a common MVA base.
4. Individually consider all motors 100 horsepower and greater. Group motors less than 100 horsepower into one equivalent motor at the motor control center bus or switchboard distribution section.
5. A table indicating the rating of each interrupting device related to the calculated duty, and suggest changes when appropriate.
6. A table showing settings for all adjustable devices. Furnish these settings as a practical compromise between protection of equipment and coordination of downstream devices.
7. Time-current coordination curves to illustrate the protection and coordination achieved. Furnish these curves that include:
  - a. Appropriate NYCBC and NEC protection points
  - b. Appropriate ANSI protection points
  - c. Transformer magnetizing inrush and through-fault protective curve
  - d. Motor starting characteristics
  - e. Cable damage limit levels
  - f. One-line diagram of system plotted
  - g. Short circuit current levels at system start and at operating voltage.
8. Analysis and recommended settings for all adjustable overvoltage, undervoltage and voltage unbalance protective devices. Include voltage and time delay settings.

#### 1.05 SUBMITTALS

- A. Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings.
  1. An executive summary of the study results and data
  2. A tabulation of all protective device ratings compared with calculated fault duties
  3. A tabulation of settings for all adjustable protective devices
  4. Copies of all time-current coordination curves
  5. Analysis of the data that led to the conclusions and recommendations included in the executive summary
  6. The one-line diagram of the system studied, including all rating and identifications

7. Copies of all computed results referenced to the one-line diagram and the impedance listing
  8. Furnish six bound copies of the final report
  9. Furnish four CD-ROM containing the following:
    - a. Complete copy of the report in PDF format
    - b. Acrobat Reader
    - c. Distribution system one-line diagrams in AutoDesk AutoCAD latest version drawing format.
    - d. All short circuit and coordination study input data and component library files in format suitable for input into SKM PowerTools.
    - e. All voltage data.
  - B. A preliminary estimate of the available short circuit levels for major electrical equipment shall be submitted with the equipments' shop drawing to verify the ratings of same are adequate for this application.
- 1.06 QUALITY ASSURANCE
- A. Qualifications: Conduct the study using a power-system engineering, study or analysis organization with the following qualifications:
    1. Three or more years experience on this type of work
    2. A proven computer program for performing 3-phase fault-duty calculations
    3. Demonstrated capability for calibrating and setting protective devices
    4. Furnish the services of a lead individual for the study who has a minimum of three years experience in performing 3-phase, fault-duty calculations.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. General: Gather the necessary data to complete the short circuit and protective curve coordination calculations. Obtain from field surveys and shop drawings informational data pertaining to product manufacturer, type and rating of PT's, CT's circuit breakers, fusing, relays, auxiliaries, and the like. Distribution equipment and shop drawing data may be reviewed at the site.

- B. Data: Estimate the lengths and sizes of cables shown on the one-line diagrams from the Contract Drawings or from field observations and measurements.

### 3.02 SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE EVALUATION STUDY

- A. General: Include in the input data for the short circuit study the power company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.
- B. Calculations: Calculate the three-phase, bolted, short circuit and single-phase, line-to-ground short circuit current values. Calculate close and latch duty values and interrupting duty values on the basis of calculated three-phase, bolted, short circuit currents at each bus. Buses include, but are not limited to, transformers, switchgears, medium-voltage motor control centers, switchboards, low-voltage motor control centers, distribution panelboards, pertinent branch circuit panels, automatic transfer switches and other significant locations throughout the system. Include in the short circuit tabulations symmetrical fault currents and X/R ratios. List for each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, with its respective X/R ratio.
- C. Protective Device Evaluation Study: Perform a protective device evaluation study to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards.

### 3.03 PROTECTIVE DEVICE COORDINATION STUDY

- A. General: Perform a protective device coordination study to provide the necessary calculations and logic decisions required to select or to check the selection of power-fuse ratings, protective-relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage, breaker trip characteristics and settings.
- B. Study Items: Include in the coordination study all medium and low voltage classes of equipment from the building or plant service protective devices down to and including the highest rated device in the low-voltage motor control centers, Automatic Transfer Switches and panelboards. Include the phase and ground overcurrent protection as well as the settings of all other adjustable protective devices.
- C. Plotted Data: Plot the time-current characteristics of the specified protective devices on log-log paper. On the plots, include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, and the complete operating bands of low-voltage, circuit breaker, trip curves and fuses. Indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer

magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. Adhere to all restrictions of the Electrical Code for the City of New York, National Electrical Code and proper coordination intervals and maintain separation of characteristic curves. Furnish the coordination plots for phase and ground protective devices on a system basis. Use a sufficient number of separate curves to clearly indicate the coordination achieved.

- D. Tabulation of Data: Furnish the selections and settings of the protective devices separately, in tabulated form, listing circuit identification; IEEE device number; current transformer ratios and connection; manufacturer and type; range of adjustment and recommended settings. Furnish a tabulation of the recommended power fuse selection for the medium-voltage fuses where applied in the system.
- E. Settings: Furnish the protective relay characteristics; tap and time dial settings required by the coordination study to the switchgear manufacturer for selection of protective devices.
- F. Provide a preliminary version of the Short Circuit Study that will enable evaluation of the projects' major electrical equipment ratings prior to shop drawing submittal.

### 3.04 STUDY REPORT

- A. General: Summarize the results of the power system study in a final report.
- B. Presentation of Report: Include the following sections in the report:
  - 1. Executive Summary
  - 2. Description, purpose, basis and scope of the study and a one line diagram of that portion of the power system which is included within the scope of the study
  - 3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding the same
  - 4. Protective-device, time-versus-current, coordination curves; tabulations of relay and circuit breaker trip settings; fuse selections, and commentary regarding the same
  - 5. Fault current calculations including a definition of terms and guide for interpretation of computer printout

-END OF SECTION-



NO TEXT ON THIS PAGE

**Section 16121**  
**WIRES AND CABLES - 600 VOLTS AND BELOW**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing all wires and cables rated at 600 volts and below for complete electrical systems as shown.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods
- B. Section 16075 - Electrical Identification
- C. Section 16741 - Paging System
- D. Section 16751 - Access Control System
- E. Section 16752 - Digital Video System
- F. Section 13851 - Fire Alarm and Detection System
- G. Section 16723 - Fiber Optic Cable
- H. Division 17 - Instrumentation

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. ASTM B 3 - Standard Specifications for Soft or Annealed Copper Wire
  - 2. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
  - 3. ASTM B33 - Standard Specification for Tinned and Annealed Copper Wire.
  - 4. ASTM B496 - Standard Specification for Compact Round Concentric Lay Stranded Copper Wire
  - 5. TIA/EIA 568-A - Commercial Building Telecommunications Cabling Standard
  - 6. NYCBC - New York City Building Code

**1.04 SUBMITTALS**

- A. Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's catalog data for each type of wire and cable furnished.

## 1.05 QUALITY ASSURANCE

- A. General: Furnish wire and cable in accordance with applicable IEEE and NEMA standards, meeting the requirements of the NYCBC, NEC and UL listed.
- B. Tests: Furnish cables factory tested prior to shipment in accordance with ICEA standards for the insulation specified.
- C. Installer Qualifications: Cabling installer must have on staff personnel certified by Building Industry Consulting Service International.
  - 1. Installation Supervision: Installation shall be under the direct supervision of a registered technician.
- D. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory.
  - 1. Testing Agency's Field Supervisor: Person currently certified by Building Industry Consulting Service International as a Registered Communications Distribution Designer (RCDD) to supervise field quality control testing.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle wire and cable in accordance with the manufacturer's instructions and as specified in Division 1.
- B. Storage: Store cable reels on concrete or other hard surface or on 2x4 wood laggings.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Wire and Cable
    - a. United Copper Industries
    - b. Southwire Company
    - c. Cerrowire
    - d. The Okonite Company

2. Instrumentation Cable
  - a. Belden
  - b. Dekoron
  - c. The Okonite Company
3. Multiconductor Cable (Power)
  - a. The Okonite Company
  - b. Southwire Company
4. Voice, Data (Local Area Network), Data Highway, Access Control System and Digital Video Cables
  - a. Belden
  - b. Alpha
  - c. Dearborn Wire and Cable
5. Paging Cable
  - a. ComTrol International
  - b. Gai-Tronics Corporation
6. Wire Connectors
  - a. Thomas & Betts
  - b. 3 M/Electrical Products Division
  - c. Ideal
7. Color Coding Marker
  - a. W. H. Brady Company
  - b. Thomas & Betts
8. Fire Alarm Cables
  - a. Lake Cable
  - b. Belden
  - c. Rockbestos Superant

## 2.02 MATERIALS

- A. Conductors: Provide soft drawn or annealed copper conductors with 98 percent minimum conductivity, meeting requirements of ASTM B 3 (solid) or ASTM B 8 (stranded). Use stranded conductors except solid No. 12 and No. 10 AWG may be used in lighting fixture and convenience outlet wiring.

B. Insulation: Provide wires and cables with insulation as follows:

1. Power, control and lighting wiring

a. Single Conductor: Provide insulation as follows:

<u>Conductor Size</u>	<u>NEC Type Letter</u>	<u>Insulation Material</u>
Nos. 14, 12 and 10 AWG	XHHW	Cross-linked Polyethylene
No. 8 AWG and Larger up to and including 500 kcmil	RHW	Cross-linked Polyethylene
600 kcmil and Larger	XHHW	Cross-linked Polyethylene

b. Multiconductor Cables: Insulate individual conductors with 15 mils of polyethylene or PVC and 4-mil nylon jacket. Wrap the conductors with binder and an outer jacket not less than 45 mils of PVC. Use ICEA Method 1 for color coding wires.

2. Instrumentation Wiring: The manufacturer's name and catalog numbers shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.

a. Two conductor or single pair: Stranded No. 16 AWG wire, 600 volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8719.

b. Three Conductor: Stranded No. 16 wire, 600 volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8618.

c. Multiple Pairs or Triads: Provide individually shielded pairs or triad of stranded No. 16 AWG wire with overall shield. Insulate each wire for 600 volts with 15 mils of PVC and a 4-mil nylon jacket. Assemble pairs or triads with tinned copper drain wire and metalized tape shield providing 100 percent shield coverage. Cable pairs or triads together with tinned copper drain wire and overall metalized tape shield.

3. Voice and Data (Local Area Network) Cable: The manufacturer's name and catalog numbers shown below are for the purpose of establishing quality and

general configuration. Equivalent products of other manufacturers may be submitted for approval.

- a. Voice Cable: Category 6, provide cable having third party verification to TIA/EIA 568-B.2-1 Category 6 requirements and constructed of four pair of stranded No. 23 AWG solid copper wire, polyethylene or polypropylene insulation and outer jacket of gray PVC. Belden Cat. No. 1872A.
  - b. Data Cable: Category 6, provide cable having third party verification to TIA/EIA 568-A Category 6 requirements and constructed of four pair of stranded No. 23 AWG solid copper wire, polyethylene or polypropylene insulation and outer jacket of blue PVC. Belden Cat. No. 1872 -EE 3A.
4. Data Highway Cable: The manufacturer's name and catalog number shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
    - a. Twinaxial: Provide stranded No. 20 AWG tinned copper wire (9.5 ohms/ 1000'), 78 ohm nominal impedance, 300 volt polyethylene insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and 55 percent tinned copper braid shield (4.1 ohms/1000') and outer jacket of blue PVC. Belden Cat. No. 9463.
  5. Constant Tension Winch Encoder Cable: The manufacturer's name and catalog number shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
    - a. Four pair: Provide individually shielded pairs of tinned No. 24 AWG copper wire, 300 volt polyethylene insulation, twisted conductors, tinned No. 24 AWG copper drain wire, overlapped metalized tape providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 9728.
  6. Paging System Cable: Provide cables compatible with the paging system specified in Section 16741 - Paging System. The manufacturer's name and catalog number shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
    - a. Paging cable: Provide sixteen soft drawn bare copper conductor cable consisting of one twisted pair #18 AWG (page line); five twisted pairs #18 AWG (party lines); one 18 AWG (control); one twisted pair #14

AWG (power) and one #14 AWG (ground). ComTrol International Cat No. WI2913.

7. Access Control System Cables: Provide cables compatible with the access control system specified in Section 16751 – Access Control System. The manufacturer's name and catalog numbers shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
  - a. Twelve conductor-Twenty Four Volt Power Cable: Provide stranded conductor No. 16 AWG wire, 600 volt PVC insulation, twisted conductors and outer jacket of PVC. Belden Cat. No. 7427A.
  - b. Door Position Cable: Provide stranded two conductor No. 18 AWG wire, 600 volt PVC insulation, twisted conductors and outer jacket of PVC. Belden Cat. No. 7409A.
  - c. Electrical Strike/Electric Mortise Lock Cable: Provide stranded two conductor No. 18 AWG wire, 600 volt PVC insulation, twisted conductors and outer jacket of PVC. Belden Cat. No. 7409A.
  - d. Exit Push-button Cable: Provide stranded two conductor No. 18 AWG wire, 600 volt PVC insulation, twisted conductors and outer jacket of PVC. Belden Cat. No. 7409A.
  - e. Entry Card Reader Cable: Provide stranded seven conductor No. 20 AWG wire, 600 volt PVC insulation, twisted conductors, tinned copper braid shield and outer jacket of PVC. Belden Cat. No. 7404AS.
8. Digital Video System Cable: Provide cables compatible with the digital video system specified in Section 16752 – Digital Video System. The manufacturer's name and catalog numbers shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
  - a. Twelve conductor-Twenty Four Volt Power Cable: Provide stranded two conductor No. 16 AWG wire, 600 volt PVC insulation, twisted conductors and outer jacket of PVC. Belden Cat. No. 7427A.
  - b. Four Conductor: Stranded No. 16 wire, 600 volt PVC insulation and outer jacket of PVC. Belden Cat. No. 7423A.
  - c. Digital Video Category 6 Cable: Category 6, provide cable having third party verification to TIA/EIA 568-B 2-1 Category 6 requirements and constructed of four pair of twisted No. 23 AWG solid copper wire,

polyethylene or polypropylene insulation and outer jacket of orange PVC. Belden Cat. No. 1872A.

- d. Digital Video Coax RG-59/U Cable: Provide coaxial cable with 75-ohm nominal impedance with a maximum attenuation of 8 dB/100 ft from 7 to 1000 MHz consisting of No. 20 AWG, solid, copper conductor; gas-injected, foam-HDPE insulation. Double shielded with 100 percent aluminum polyester tape and a copper braid, orange PVC jacket Belden Cat. No. 1505A.
9. Fire Alarm Cable: Provide cables compatible with the fire alarm system specified in Section 13851 Fire Alarm and Detection System. The manufacturer's name and catalog numbers shown below are for the purpose of establishing quality and general configuration. Equivalent products of other manufacturers may be submitted for approval.
- a. Plenum Cable: Provide NEC Type FPLP cable consisting of two solid conductor No.16 AWG, 300 volt FEP insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and red Flamarrest outer jacket. Belden Cat. No. 6220FK.
  - b. Riser Cable: Provide NEC Type FPLR-CIC cable consisting of two solid conductor No.16 AWG, 300 volt silicone rubber insulation with tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and red FRPE outer jacket. Belden Cat. No. 5220FZ.
  - c. General Purpose Cable: Provide NEC Type FPL cable consisting of two solid conductor No.16 AWG, 300 volt foam high-density polyethylene insulation with tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and red PVC outer jacket. Belden Cat. No. 5220FJ.
- C. Printed Data on Covering: Provide the following information printed on the surface of all wires and cables at regular intervals throughout the entire length.
1. Manufacturer or trade name
  2. Size of conductor
  3. Type of insulation
  4. Voltage classification

## 2.03 WIRE CONNECTIONS AND CONNECTING DEVICES

- A. Connectors for No. 10 AWG and Smaller: Provide insulated compression type butt connectors.



- B. Connectors for No. 8 AWG and Larger: Provide UL, Inc. listed compression type tube connectors for parallel or butt splices. Provide companion preformed plastic insulating covers or tape to provide insulation equal to conductor insulation.
- C. Miscellaneous Connectors: Provide preinsulated spring connectors for lighting and receptacle splices and pigtails using solid conductors. For small gage stranded conductors use connectors approved for that application.
- D. Solderless Lugs: Provide solderless terminal lugs for stranded and multiple solid conductors at connection to terminals or use UL listed crimp tool compression style lugs. All solderless lugs shall be copper. No aluminum or copper/aluminum lugs will be accepted.
- E. Control Wire Terminations: Provide spade lug or pressure type control conductor connection terminations for control wiring terminations. Provide lug bolting at devices or bus bars with a flat washer, a Belleville washer and a locknut.

## 2.04 COLOR CODING

- A. Use a vinyl impregnated cloth tape resistant to oil, dirt and heat for conductor color coding.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Swab new and existing conduits to be used to clear debris and remove moisture before conductor installation. Install conductors in raceways with no splices between boxes.
- B. Pulling Equipment
  - 1. Pull conductors using proper equipment without exceeding manufacturer's recommendation for maximum pulling tension. Protect conductor insulation jacket at all times from twists, kinks, scrapes, punctures and other damage. Replace damaged conductors. Pull wires and cables into ducts and conduit without the use of lubricants, except where such use is necessary and approved by the cable manufacturer and the Engineer. Use UL listed lubricating compound compatible with the conductor insulated jacket and with the raceway.
  - 2. Use lines of nylon or polypropylene, propelled by carbon dioxide, or compressed air, to snake or pull wire and cable into conduits. Do not use flat steel tapes or steel cables.
- C. Conductor Support: Support conductors in vertical risers with woven grips to prevent loading on conductor connectors.

- D. Seals: Provide a seal between the conductor and conduit for conduits entering buildings or from areas where the temperature change may cause condensation or moisture. Seal the conduits after the conductors are in place.
- E. Identification: Identify all cables as specified in Section 16075 - Electrical Identification.
- F. Color Coded Tape
1. Apply color coding tape at all terminations and splices with overlapping turns for a minimum length of two inches, starting two inches back from the termination point. Provide color code tape in all boxes and manholes.
  2. Provide color coding throughout the entire network for service, feeder, branch, control and low energy signal circuit conductors. Use the following color code for conductors.

COLOR CODING					
<u>SYSTEM</u>	<u>PHASE</u> <u>A</u>	<u>PHASE</u> <u>B</u>	<u>PHASE</u> <u>C</u>	<u>NEUTRAL</u>	<u>GROUND</u>
208Y/120 three phase	Black	Red	Blue	White	Green
240/120 Single phase	Black	Red	Blue	White	Green
480 & 480Y/277 three phase	Brown	Orange	Yellow	White	Green
Control and low- energy signal	Red	---	---	White	Green
Gas . Fire De- tection and Alarm Systems	Red	---	---	---	---
Instru- mentation	Tan	---	---	---	---

- G. Terminations: Leave a minimum of six inches of free conductor at each connected outlet and a minimum of nine inches at unconnected outlets.
- H. Code Requirements: Install wiring in accordance with applicable provisions of NYCBC, National Electrical Code, and as indicated.
- I. Conductor Sizing: Size conductors in accordance with the NYCBC, NEC and the following:
  - 1. Size for branch lighting circuits so that the greatest voltage drop between lighting panel and center of load does not exceed two percent at rated load.
  - 2. Size conductors to limit the maximum conductor temperature to less than 75 degrees C, except where specifically stated otherwise.
  - 3. Use minimum conductor sizes as follows:
    - a. Power and lighting branch circuits, No. 12 AWG
    - b. 120-volt control circuits, No. 14 AWG
    - c. Instrumentation and signal wiring, 2 or 3 conductors No. 16 AWG stranded shielded
  - 4. Size conductors as shown or as required by the actual load to be served, whichever is larger.
- J. Splicing: Install continuous cables without splices in all duct systems.
- K. Instrumentation wiring: Install instrumentation wiring as follows:
  - 1. Wherever possible provide continuous instrumentation wiring without splices from field device to instrument. Where connections are required, make all connections in terminal boxes.
  - 2. Terminate instrumentation wiring at terminal blocks only.
  - 3. Where instrumentation wire is required to be connected in a terminal box, provide an isolated terminal for each shield.
  - 4. Ground instrumentation shields and drain wires only at the panel end of loop.
  - 5. Install clear, heat-shrink, seamless tubing over exposed shields and drain wires in all terminal boxes, junction boxes, panels and field devices.

L. Category 6 Wiring: Install instrumentation wiring as follows:

1. Install UTP cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
2. Do not untwist more than 1/2 inch of Categories 6 cables at connector terminations.

M. Accuracy of Information: The number and sizes of wires and conduits indicated are for guidance only and are not necessarily the correct number and sizes necessary for actual equipment installed. Install as many wires and conduits of the required size as necessary for a complete electrical system, and provide adequately for the equipment actually installed.

### 3.02 CONDUCTOR IDENTIFICATION

- A. Labeling: Label each wire at both termination points and at each splice point in junction boxes. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identification: Where the total number of control and signal wires is three or more and no terminal board is provided, identify each wire in junction boxes and cabinets by means of plastic slip-on wire marker.
- C. Plastic Tags: In manholes, identify each wire by laminated plastic tag located so it can be easily seen.
- D. Color Coordination: Connect circuit conductors of the same color to the same phase throughout the installation.

### 3.03 WIRE AND CABLE CONNECTIONS TO EQUIPMENT

- A. Provide electrical connections to all equipment in strict accordance with the manufacturer's approved wiring diagrams, the Contract Drawings, or as approved. Repair or replace any damaged equipment resulting from erroneous connections.

### 3.04 CONNECTOR AND TERMINAL LUG INSTALLATION

- A. UL Requirements: Install all connectors and terminal lugs in accordance with UL requirements and manufacturer's recommendations.

### 3.05 QUALITY ASSURANCE

- A. Field Tests: Test the following 600-volt wires and cables after installation but before final connections are made up in accordance with Section 16080 - Electrical Testing Requirements:

1. All secondary feeders from the Utility transformers.
  2. All feeders between and from the low voltage switchgear assemblies.
  3. All feeders from motor control centers and Power Panels to motors 30 hp and larger.
  4. All feeders from motor control centers, to lighting panels and dry-type transformers.
  5. For the above listed cables, apply a test voltage of 1,500 volts ac for a period of 1 minute between all conductors in the same conduit, and between each conductors and ground.
  6. Any feeder or branch circuit that may have been damaged by installation conditions (excessive length of pull, unexpected resistance, pulling through a conduit body) shall be tested to determine its suitability to provide service life equal to a new undamaged cable of similar characteristic.
- B. Test Results: Make all tests and submit certified test results. Replace any cables that fail the tests.
- C. Continuity Test: Perform continuity test to demonstrate proper cable connection.
- D. Category 6 Cabling Tests: Perform the following test on the Category 6 installation:
1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2.
  2. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  4. Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
  5. Channel and permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal-level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with minimum criteria in TIA/EIA-568-B.2.

6. Channel and permanent link tests shall be performed with a tester that complies with performance requirements in TIA/EIA-568-B.2, Level III. Include tests for longitudinal or transverse conversion loss.
7. Performance shall comply with minimum criteria in TIA/EIA-568-B.2.

-END OF SECTION-

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**Section 16122**  
**MEDIUM VOLTAGE CABLES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for providing single conductor medium voltage cables and accessories as indicated, in accordance with the Contract Documents.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electric Materials and Methods
- B. Section 16075 - Electrical Identification
- C. Section 16080 - Electrical Testing Requirements
- D. Section 16210 - Electric Service
- E. Section 16132 - Underground Electric Distribution System

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
- 1. ASTM B 8 - Specification for Concentric Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft
  - 2. ASTM B 496 - Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
  - 3. AEIC CS8 - Specifications for Extruded Dielectric Shielded Power Cables Rated 5 through 46 kV
  - 4. UL 1072 - Medium Voltage Power Cables
  - 5. IEEE 400 - IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field
  - 6. NEC - National Electrical Code
  - 7. NYCEC - New York City Electrical Code
  - 8. EO-17 - Con Edison MV Cable Purchase Specification.

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electric Materials and Methods.



- B. Product Data and Information: Furnish physical and electrical catalog data for all cables and cable components and working drawings for splice kits and terminations.
- C. Quality Control: Furnish certified Shop Test Reports for all cable lengths shipped, and AEIC Qualification Test Reports.
- D. Number of Copies: Submit six copies of certification and warranties as described.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Handling: Handle the cables carefully to avoid twists and kinks or other damage to the insulation.
- C. Storage: Store cable reels on concrete or other hard surface or on 2 x 4 wood lagging.

#### 1.06 WARRANTY

- A. Written Warranty: Furnish a written 40-year minimum warranty from the cable manufacturer that the cable is free of any factory-incurred defects.
- B. Replacement if Found Defective: In the event the cable is found defective in design, material, or workmanship within the 40-year design life of the cable, remove and replace the defective portion of the cable with another cable meeting the original design specifications for the failed cable. Provide the replacement cable with the same warranty as the replaced cable and at no additional cost to the City.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. The Kerite Company
  - 2. The Okonite Company

#### 2.02 MATERIALS

- A. General: Provide single medium voltage power cable consisting of stranded copper conductors, conductor screen, insulation, insulation screen, metallic shield and outer jacket, suitable for use in wet and dry locations in conduit, underground

concrete encased ducts, directly buried, and aerial installation. Provide cables rated 90 degrees C for continuous operation, 130 degrees C for emergency overload operation and 250 degrees C for short circuit conditions, UL listed as Type MV-105 in accordance with UL 1072 and manufactured in accordance with AEIC CS8.

- B. Conductors: Provide soft drawn, annealed and uncoated copper conductors with 98 percent minimum conductivity in accordance with the requirements of ASTM B 8, with Class B stranding or compact stranding meeting the requirements of ASTM B 496. Provide conductor sizes as scheduled and as required.
- C. Conductor Screen (Shield): Provide conductor screen of an extruded layer of semiconducting, thermosetting compound.
- D. Insulation: Provide conductor insulation other than black or grey in color of a compound based on a thermosetting ethylene-propylene elastomer extruded in tandem with and inseparably bonded to the conductor screen. Provide insulation resistant to heat, moisture, impact, ozone and electrical discharge. Provide the insulation thickness as shown below:
  - 1. For nominal 13.2 kV applications
    - a. Voltage rating 15,000 volts
    - b. Insulation thickness 220 mils
    - c. Insulation level 133 percent
  - 2. For nominal 27 kV applications
    - a. Voltage rating 35,000 volts
    - b. Insulation thickness 345 mils
    - c. Insulation level 100 percent
- E. Insulation Screen (Shield): Provide insulation screen of an extruded semiconducting compound. Provide insulation screen that is easily removed without requiring the use of heat or special tools.
- F. Metallic Shield: Provide 5-mil thick helically applied coated copper tape shield over insulation screen with a 20 percent minimum overlap.
- G. Outer Jacket: Provide an outer jacket of heavy-duty thermoplastic black polyvinyl chloride (PVC).

## 2.03 COMPONENTS

- A. Splice Kit: Provide splice kits and terminations specifically designed for the application as recommended by the cable manufacturer.

- B. Connections: Provide splice and connections made up with closed end compression connectors and terminal lugs. Provide fittings and compression tools of the circular or hexagonal compression type rated for the voltage of the cable.

2.04 SOURCE QUALITY CONTROL

- A. General: Perform the following shop tests in accordance with the requirements of AEIC and furnish certified test reports for all cable lengths shipped.
1. Qualification tests
  2. High voltage ac and dc tests
  3. Insulation resistance test
  4. Partial discharge test
- B. Test Reports: Furnish certified test report for all cable lengths shipped.
- C. Cables shall comply with Con Edison applicable standards for material, installation and testing.

PART 3 EXECUTION

3.01 PREPARATION

- A. Conduit Preparation: Mandrel all new and existing conduits and duct lines before installation and swab to remove accumulated moisture and debris before cables are pulled.

3.02 INSTALLATION

- A. General: Install all medium voltage cables in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Initial Pulls: Use lines of limited stretch to pull wire and cable into conduits. Do not use flat steel tapes and steel cables.
- C. Lubricants: Provide cable lubricants recommended by the manufacturer when pulling the cables into ducts and conduits.
- D. Pull Setup: Provide complete cable pulling setup, including winches, cable reel, support frames, turning sheaves, guides and the like.
- E. Tension Meters: Connect a pulling tension meter to the pulling setup. Arrange the pulling equipment and apply pulling methods so that pulling tensions do not exceed the manufacturer's permissible limits for the cable furnished.
- F. Cable Groupings: Arrange cables securely tied, neatly bundled and racked in manholes.

- G. Splices: Do not make splices within the conduit system. Do not make splices within handholes or manholes unless approved.
- H. Fireproofing (Arcproofing): Fireproof (arcproof) all medium voltage cables installed in manholes and pullboxes. Provide fireproofing (arcproofing) with approximately 30 mils thick by 3 inches wide fireproofing tape and applied tightly around each cable spiral in one-half lapped wrapping or in a butt jointed wrapping with a second wrapping covering joints of the first wrapping. Smooth irregularities in cables, such as at splices, with insulating putty before applying fireproofing tape. Install the tape with coated side toward the cable to extend not less than one inch into conduit. Install a random wrapping of glass cloth electrical tape around installed fireproofing tape to prevent unraveling. Provide fireproofing (arcproofing) tape consisting of a flexible, conformable fabric with one side coated with a flame retardant, flexible, polymeric coating or a chlorinated elastomer. Provide tape that is non-combustive and noncorrosive to the cable sheath.
- I. Terminators: Install medium voltage termination as recommended by the cable manufacturer.
- J. Lug Bolting: Provide connections at terminals, devices and bus bars made up of a flat Belleville or equal washer, and a locknut.
- K. Unacceptable Connections: Do not use indenter type compression fittings. Mechanical splices or lugs are not acceptable.

### 3.03 IDENTIFICATION OF CIRCUITS

- A. Identify all cables in accordance with the requirements contained in Section 16075 - Electrical Identification and as follows.
- B. Color code the cables with the following color code scheme.

Phase A	-	Brown
Phase B	-	Orange
Phase C	-	Yellow
Neutral	-	White
Ground	-	Green

- C. Coding Tape: When using color coding tape apply the tape with overlapping turns for a minimum length of 2 inches starting 2 inches back from the termination point.

### 3.04 FIELD QUALITY CONTROL

- A. Inspection: Arrange inspection of the cable (including splices and terminations) installation by the manufacturer. Furnish manufacturer's certificate that the cable was installed properly.

- B. Field Tests: Arrange the performance of following field tests in presence of the Resident Engineer after terminations have been made up, but before final connections are made to equipment terminals.

1. Cable continuity test using a test light or a buzzer.
2. Cable insulation level (high voltage dc) test using approved dc HI-POT equipment in accordance with IEEE 400 for the voltage rating and insulation thicknesses given below; by an independent testing agency in accordance with Section 16080 - Electrical Testing Requirements:

Voltage Rating	Insulation Thickness	dc Test Voltage	Time of Application
15,000 volts	220 mil	65 kV	15 Minutes
35,000 volts	345 mil	100 kV	15 Minutes

-END OF SECTION-

**Section 16130**  
**ELECTRICAL RACEWAY SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing electrical raceway systems as indicated, in accordance with the Contract Documents.

**1.02 RELATED SPECIFICATIONS**

1. Section 09912 - Interior Painting
2. Section 16050 - Basic Electrical Materials and Methods
3. Section 16071 - Supporting Devices
4. Section 16132 - Underground Electrical Distribution System

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. ANSI C80.1 - Specifications for Rigid Steel Conduit, Zinc Coated
2. ANSI C80.3 - Specifications for Electrical Metallic Tubing, Zinc Coated
3. ANSI/NFPA 70 - National Electrical Code
4. NEMA RN1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
5. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
6. NEMA TC14 - Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
7. UL 1 - Flexible Metal Conduit
8. UL 6 - Rigid Metal Conduit
9. UL 360 - Liquid-Tight Flexible Steel Conduit
10. UL 651 - Schedule 40 and 80 Rigid PVC Conduit
11. UL 797 - Electrical Metallic Tubing

- 12. NYCBC - New York City Building Code.
- 13. ETL PVC001 - Intertek SEMCO Coating Adhesion Test

#### 1.04 SUBMITTALS

- A. Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
  - 1. Certification of training for installation of PVC Coated RGS raceways for each individual installer and supervisor/foreman. Certificates shall be issued and signed by the raceways manufacturer or their representative.
  - 2. Manufacturers' product data and engineering information for each product they supply under this section of the specification.
  - 3. Raceway layouts for equipment indicated on the project plans, as required by section 16050. This includes raceways, pull/junction boxes and terminal boxes.
  - 4. Raceway layouts for all branch circuits that supply lighting, receptacles, 1 phase motors and heaters, telephone/data/paging, security (access control and CCTV), fire detection and alarm and other loads where raceway layouts are not indicated on the plans.

#### 1.05 QUALITY ASSURANCE

- A. Codes: Provide all materials and workmanship to meet the requirements of the NYCBC and ANSI/NFPA 70 National Electrical Code.
- B. Regulatory Requirements: Provide UL listed components.
- C. Provide verification of PVC coated raceway and fitting coating compliance with references and applicable standards.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

## 1. Rigid Steel Conduits and Electrical Metallic Tubing

- a. Allied Tube and Conduit
- b. Wheatland Tube Company
- c. LTV Steel Tubular Products Company

## 2. PVC Coated Steel Conduits Fitting and Boxes

- a. KorKap
- b. Perma-Cote Industries
- c. Plasti-Bond

## 3. Rigid Nonmetallic Conduits

- a. Prime Company
- b. Certainteed Corporation
- c. National Pipe Company

## 4. Fiberglass Conduits

- a. Champion Fiberglass Inc.
- b. FRE Composites

## 5. Liquidtight Flexible Steel Conduit

- a. Electri-Flex Company
- b. The International Metal Hose Co.
- c. Alflec Corp.
- d. Anamet, Inc.

## 6. Conduit Fitting and Connectors

- a. Appleton Electric Company
- b. Thomas & Betts
- c. Crouse Hinds Company
- d. OZ/Gedney Company
- e. Killark
- f. Adalet-PLM



7. Boxes and Enclosures
  - a. Appleton Electric Company
  - b. Raco/Bell
  - c. Crouse Hinds Company
  - d. Thomas & Betts
  - e. Hoffman
  - f. Hope
  - g. OZ/Gedney Company
8. Fire Stop System
  - a. 3M/Electrical Products Division
  - b. International Protective Coatings
  - c. Nelson Electric
9. Terminal Blocks
  - a. Phoenix Contact
  - b. Entrelec
  - c. Weidmuller

## 2.02 RACEWAYS

- A. General: Provide minimum 3/4-inch raceways.
- B. Raceway Requirements: Provide raceways meeting the following requirements:
  1. Provide rigid steel, heavy wall, hot-dip galvanized in accordance with the requirements of UL-6 and ANSI C80.1.
  2. Provide electrical metallic tubing hot dip galvanized conduit in accordance with the requirements of UL 797 and ANSI C80.3.
  3. Provide PVC coated rigid steel in accordance with the requirements for rigid steel raceway herein and with 40 mils bonded PVC exterior coating meeting requirements of NEMA RN-1. Provide a nominal 2 mil urethane interior coating and a clear urethane coating over the galvanized threads.
  4. Provide rigid nonmetallic Schedule 40 PVC conduit in accordance with requirements of NEMA TC2 and UL 651 with solvent cement joints.
  5. Provide rigid nonmetallic fiberglass/epoxy conduit in accordance with requirements of NEMA TC14 with epoxy adhesive joints.
  6. Provide liquidtight flexible single strip steel, hot-dip galvanized conduit with PVC jacket in accordance with requirements of UL 1. Provide a continuous copper bonding conductor wound spirally between convolutions on the

inside of the conduit meeting requirements of UL 360 for conduit sizes 1-1/4-inch and smaller.

## 2.03 FITTINGS

- A. General: Provide fittings of similar material as raceways.
- B. Fittings Requirements: Provide fittings meeting the following requirements:
  - 1. Set screw or indenter type fittings are not acceptable. Provide threaded connectors for all rigid metal conduits.
  - 2. Provide solvent cement connections for all rigid nonmetallic conduits.
  - 3. Provide gland compression type fittings for all electrical metallic tubing. Provide insulated type box connectors.
  - 4. Provide insulated connectors for liquidtight flexible conduit.
  - 5. Expansion/Deflection Fittings
    - a. Provide a deflection and expansion coupling for rigid conduits that have a 3/4 inch movement in all directions from normal and a 30 degree angular deflection. Provide coupling that includes internal bonding jumper.
    - b. Provide a nonmetallic expansion coupling for nonmetallic conduits that have a 4-inch maximum expansion.
  - 6. Bushings
    - a. Provide insulated nonmetallic bushing rated 105 degrees C for all installations where bonding is not required.
    - b. Provide insulated metallic grounding and bonding bushing rated 150 degrees C where bonding is required.

## 2.04 WALL AND FLOOR PENETRATIONS

- A. Watertight
  - 1. For conduit penetrations in new exterior walls or floors provide watertight sealing sleeves consisting of a steel sleeve with pressure ring and clamps.
  - 2. For conduit penetrations in existing walls or floors, provide watertight sealing bushing consisting of a neoprene sealing ring between two PVC coated steel pressure discs. Provide stainless steel captive screws for sealing ring compression.

**B. Fire-proofing Through Fire Rated Construction**

1. Provide a permanent fire stop system for all penetrations through fire-rated walls, partitions and floors.
2. Design fire stop system to maintain the integrity of the wall or floor assembly for its rated time period.
3. Arrange fire stop system to allow normal pipe movement without being displaced.
4. Do not utilize asbestos in fire stop systems.
5. Provide an intumescent fire stop system when exposed to flame or heat.

**2.05 BOXES AND CABINETS****A. Outlet Box Requirements**

1. Provide galvanized cast iron boxes for galvanized rigid steel conduit systems.
2. Provide PVC coated boxes and covers in PVC coated conduit systems.
3. Provide pressed steel boxes and covers in electrical metallic tubing conduit systems.
4. Provide corrosion-resistant fiberglass reinforced polyester boxes with stainless steel hardware in corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown.
5. Provide watertight gasketed covers held with nonferrous screws for all cast metal boxes.

**B. Junction and Pull Box Requirements**

1. Provide cast aluminum boxes with mounting lugs, threaded hubs and gasket covers for surface mounted boxes
2. Provide fabricated sheet metal boxes when cast metal box weight exceeds 50 pounds. Construct box from 1/8-inch thick galvanized sheet steel or aluminum with sides return channel flanged around cover opening. Provide angle or channel supporting frame. Provide continuously welded and ground smooth seams. Provide mounting lugs and threaded conduit hubs.
3. Provide cast steel or fabricated 10-gauge Type 316 stainless steel for boxes either partially or fully encased in concrete. For partially encased boxes provide sides return channel flanged around cover opening. For fully

encased boxes provide flush covers. Provide continuously welded and ground smooth seams. Provide mounting lugs and threaded conduit hubs.

4. Provide watertight gasketed covers held with stainless-steel captive screw slot bolts.
5. Provide two padlocking hasps for boxes containing medium voltage cables.
6. Provide steel barriers to isolate conductors of different systems or voltages from each other where located in common boxes.
7. Provide fabricated boxes located indoors meeting NEMA 12 requirements.
8. Provide all boxes located outdoors meeting NEMA 4X requirements.

#### C. Terminal Box Requirements

1. Provide minimum 12 gauge stainless steel fabricated box with mounting lugs, floor stand, and hinged doors.
2. Provide the door with continuous piano hinge and 3 point lockable latch. Provide print pocket on inside of door.
3. Provide back plate fabricated from 12 gauge minimum steel with white enamel finish for mounting terminals and wire troughs.
4. Provide wire troughs consisting of plastic ducts with snap slot design and removable covers. Run all wiring within wire troughs.
5. Furnish a schedule of terminals with the following information
  - a. Source
  - b. Type of Signal
  - c. Function
6. Provide removable jumpers to allow operation of the equipment.
7. Separate analog terminals from all other terminals.
8. Provide number of terminals shown. Where the number of terminals is not shown, provide sufficient terminals for each wire entering the terminal box plus 20 percent but not less than 10 spare terminals.
9. Terminals
  - a. All catalog numbers refer to Phoenix Contact Type for the purpose of establishing the standard of quality and general configuration desired.

Equivalent products of other manufacturers may be submitted for approval.

- b. Provide symmetrical type steel mounting rails, DIN-EN50022.
- c. Analog Signals: Provide terminals in enclosed housing suitable for wires from 22 to 12 AWG rated 600 volts with gray body, knife disconnect and test connection socket on both sides of disconnect, Phoenix Contact Type UK 5-MTK-P/P.
- d. Control and Alarm Signals: Provide terminals suitable for wires from 30 to 10 AWG rated 18 amperes at 600 volts, blue body, Phoenix Contact Type UK5N BU.
- e. 120-Volt Power Wiring: Provide terminals suitable for wires from 18 to 10 AWG rated 30 amperes at 600 volts, hot (black body), neutral (white body), ground (green body, Phoenix Contact Type UK5N BK, UK5N WH & UK5N GN, respectively.

## 2.06 SUPPORTING DEVICES

### A. Raceway Supports: Provide raceway supports meeting Section 16071 - Supporting Devices and the following requirements:

- 1. Do not use perforated straps or plumbers tape for conduit supports.
- 2. Provide expansion bolts or inserts for fasteners in concrete, toggle bolts for hollow masonry or frame construction, and preset inserts for prestressed concrete.
- 3. Conduit Straps and Backs
  - a. For metallic conduits, provide steel or malleable iron.
  - b. For PVC coated conduits, provide PVC coated malleable iron with stainless steel anchors and bolts.
- 4. Conduit Hangers
  - a. For metallic conduits, provide steel adjustable conduit hangers or clevis hangers.
  - b. For PVC coated conduits, provide PVC coated adjustable conduit hangers with stainless steel hardware.
- 5. Beam Clamps
  - a. For metallic conduits, provide malleable iron with steel bolt.

- b. For PVC coated conduit, provide PVC coated malleable iron with stainless steel bolt.

6. Trapeze Hangers

- a. For metallic conduits provide 12 gauge 1-1/2-inch square steel channels with steel channel straps to secure conduits.
- b. For PVC coated conduit, provide either PVC coated 12 gauge 1-1/2-inch square steel channels or 1-5/8-inch square fiberglass channels. Provide PVC coated straps with stainless steel bolts for securing conduits.
- c. Provide addition channels welded together to limit the deflection to 1/240th of span.

7. Thread Rod

- a. Provide thread rod with the minimum size as follows:

- (1) Conduit Hangers

- (a) 3/4-inch to 1-1/2-inch conduit: 1/4-inch thread rod
    - (b) 2-inch to 3-1/2-inch conduit: 3/8-inch thread rod
    - (c) 4-inch and larger: 1/2-inch thread rod

- (2) Trapeze Hangers: Provide thread rod of sufficient size to support the load. Provide a minimum of 3/8-inch thread rod.

- b. For Metallic Conduit Systems: Provide continuous threaded galvanized steel rod.
- c. For PVC Coated Conduit Systems: Provide continuous threaded PVC coated galvanized steel rod.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. General: Install electrical equipment and material of the size, type and general routing as shown or required.
- B. Coordination with Reinforcing: Install raceway, fittings, boxes and cabinets free from direct contact with reinforcing steel.
- C. Alignment: Provide fasteners, anchor bolts, anchorage items and supports as required to insure proper and rigid alignment. Attach equipment with fasteners sized according to size and weight of the equipment and the thickness of the supporting surface.

- D. Aluminum Coating: Where aluminum is placed in contact with dissimilar metals, concrete or permanently moist surface, separate contact surfaces with gasket, nonabsorptive tape or coating as specified in Section 09912 - Interior Painting to prevent corrosion.
- E. Grounding: Make metallic raceways electrically and mechanically continuous and ground as required. Install conduits continuous between outlets, boxes, cabinets and panels.
- F. Provide a separate raceway systems for the Con Edison service, 480 volt loads, 240/208/120 volt loads, control (unless indicated otherwise on drawings), telephone, data, paging, security (access control and CCTV) and Fire Detection and Alarm.

### 3.02 INSTALLATION

- A. General: Unless otherwise indicated, install conduits exposed, parallel or perpendicular to building floors, ceilings and walls, and to avoid interference with other work. In architecturally finished areas, conceal conduits within finished walls, ceilings and floors. Cut conduits square and deburr the cuts to the same degree as the conduit manufacturer. Fasten conduit securely to outlets, junction, pull and terminal boxes. Provide caps and seals to prevent the entrance of foreign material and moisture during installation and before pulling wire.
  - 1. Where conduit size is not shown, provide conduits one size larger than indicated in Table 4, Chapter 9 of the NEC.
  - 2. Support raceways concealed above suspended ceilings from the slab above in same manner as exposed raceways. Do not support raceways from suspended ceiling supports.
  - 3. Keep conduit at least six inches away from high temperature piping, ducts, flues and surfaces. For mounting on concrete and masonry surfaces provide a minimum of 1/4-inch air space between conduit and mounting surface. Support and fasten conduit to building structural members spaced in accordance with electrical codes. Support conduit at least every eight feet or less in accordance with NYCBC and NEC requirements.
  - 4. When two or more exposed conduits are in the same general routing, provide parallel installation with symmetrical bends and for three or more provide trapeze hangers. Size trapeze hangers with space for 25 percent additional conduits.
  - 5. Make changes in direction with bends or pull boxes. Use factory-made bends or elbows wherever possible. Make field bends and offsets with a hand bender or conduit-bending machine. Provide a bending radius not less than 36-inches for conduits containing medium voltage cables.

6. Run conduit in buildings with no more than the equivalent of three 90-degree bends between pull points. Provide no more than 125 feet of conduit runs between pull points. Provide pull boxes where shown, specified or wherever required to install conductors and to meet the above requirement.
7. Install pull and junction boxes in accessible locations with working space in front of and around the installation. Obtain approval to locate boxes in finished areas.
8. Install an expansion fitting when a conduit crosses a structural expansion joint.
9. Unless otherwise approved, install conduits to cross at right angles to building structural expansion joints.
10. Where approved for encased installation, install conduits in slabs as close to the middle of concrete slabs as practicable without disturbing reinforcement. Do not use conduit with an outside diameter exceeding one-third of the slab thickness. Do not place conduits closer than three diameters on centers, except at cabinet locations where the slab thickness is increased.
11. Pitch conduits to outlet boxes to avoid trapping moisture. Where dips are unavoidable in exposed conduit runs, install drain fitting at low point.
12. Where raceways travel between areas of significantly different temperature then the raceway shall be sealed to prevent the formation of moisture in the raceway. Examples are raceway from heated to unheated spaces or inside to outside the building.
13. In branch circuits where raceway routing is not indicated on plans the Contractor shall make those layouts – respecting the following additional guidelines.
  - a. No raceway shall contain more than one multi-wire branch circuit (3 phase wires, one neutral and an equipment ground wire – or its equivalent number of conductors), in another arrangement.
  - b. No feed through boxes shall be installed in non-permanent partition walls.
  - c. Raceways installed in floor or ceiling slabs (where permitted) or above suspended ceiling shall be subject to all the tenets of Article 3.02.



**B. Conduit Material Types: Provide conduit as follows:**

1. Provide rigid steel conduits in all installations exposed or concealed in structures, concrete encased within structures or under structures.
2. Provide electrical metallic tubing in all installations above suspended ceilings and in partition constructed walls.
3. Provide rigid steel conduits for all instrumentation, and electronic equipment signal wiring in all exposed or concealed noncorrosive installations.
4. Provide rigid nonmetallic Schedule 40 conduits for low voltage communication/data, instrumentation, security and fire detection and alarm system underground, concrete encased or direct buried, unless specifically detailed otherwise.
5. Provide rigid nonmetallic fiberglass conduits underground, concrete encased for ConEdison primary feeders, unless specifically detailed otherwise.
6. Corrosive Locations
  - a. Corrosive locations are defined in Section 16050 - Basic Electrical Materials and Methods or are as shown:
  - b. Provide PVC coated rigid steel conduit in all installations in corrosive locations. Installation, terminations and extensions shall be performed in strict conformance to the manufacturer's instructions - in order to maintain the corrosion resistance of the installation.
7. Underground Conduits: Provide underground conduits meeting the requirements of Section 16132 - Underground Electrical Distribution System.

**C. Connections to Equipment**

1. Provide double locknuts and bushing for all boxes, enclosures and cabinets located in dry areas.
2. Provide watertight hub fittings for all boxes, enclosures and cabinets located below grade or in wet, damp or corrosive areas.
3. Provide rigid conduit connection where equipment is fixed and not subject to adjustment, mechanical movement or vibration. Provide union fittings to permit removal of equipment without cutting or breaking conduit.

4. Provide liquidtight flexible conduit connection where equipment is subject to adjustment, mechanical movement or vibration. Maximum length is 18 inches.
  5. Coat all threads in steel conduit runs with zinc dust in oil or other corrosion-preventive compound before making connections.
- D. Penetrations: Make concealed penetrations for single conduits not more than 1/4-inch larger than the diameter of the conduit. Make penetrations through walls, ceilings and floors other than concrete for exposed conduits not more than 1/4-inch larger than the diameter of the conduit. Fill the voids around conduit with caulking compound and finish the surface the same as the wall, ceiling or floor.
1. Where a conduit enters through a concrete roof or membrane waterproofed wall, floor or ceiling, provide a watertight sealing sleeve that can be tightened from one or both sides. If the sealing sleeve is not placed with the concrete, core drill the proper size hole to provide a mechanically watertight installation.
  2. Where a conduit enters through a concrete non-waterproofed wall, floor or ceiling, provide a galvanized steel sleeve, Schedule 40, and fill the space between the conduit and sleeve with a plastic expandable compound. If the sleeve is not placed with the concrete, drill the hole not less than 1/2-inch nor more than one inch larger than the sleeve, center the sleeve and grout the sleeve for the total depth of penetrated concrete with non-shrink grout, polyurethane or silicone sealant.
- E. Spare Conduit: Provide spare conduits for future use as shown or required. Provide a minimum 200-pound strength nylon pull line in each spare conduit and identify the origin and termination of the conduit at each end. Terminate spare conduits in equipment, boxes or by couplings plugged flush with the inside of building surfaces.
- F. Boxes: Provide boxes of the proper dimensions for the size and quantity of conductors enclosed.
1. For boxes mounted on steel, concrete and masonry surface, provide a minimum 1/4-inch non-metallic spacer to hold the box away from the surface.
  2. Provide pressed metal (seamless) boxes in all partition constructed walls.
  3. Provide separate support for boxes and bolt units to buildings with expansion anchors, toggle bolts or appropriate screws. For lighting fixture outlet boxes, provide supports adequate to support the weight of the fixture to be mounted on the box.

4. Remove debris including dust, dirt, wire clippings and insulation from the interior of boxes. Replace boxes with open conduit holes. Repair or replace damaged boxes as directed.
5. Unless otherwise indicated, mount outlet boxes flush with the finished wall or ceiling, with the long axis vertical. Unless otherwise shown or specified, provide mounting heights measured from the finished floor to centerline of the outlet box as follows:
  - a. For switches: 3'-2". Mount the box for lighting switches on the strike side of the door
  - b. For duplex convenience outlets: Finished areas 12 inches and unfinished areas 2 feet
  - c. For fixtures and equipment: As shown
  - d. For desk telephone and data outlets: 12 inches
  - e. For wall telephone and data outlets: 48 inches

### 3.03 FIELD PAINTING

- A. Paint conduits meeting the requirements of Section 09912 - Interior Painting.

-END OF SECTION-

**Section 16132**  
**UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing underground electrical cables and grounding. Raceway system consisting of concrete encased conduits, direct buried conduits, manholes, handholes, and outdoor electrical equipment pads shall be provided to meet the requirements of this specification. Raceways encased in the ramp barrier structure shall also meet the requirements of this specification.

**1.02 RELATED SPECIFICATIONS**

1. Section 02316 - Excavation
2. Section 02317 - Backfilling
3. Section 03100 - Concrete Forms and Accessories
4. Section 03200 - Concrete Reinforcement
5. Section 03300 - Cast-In-Place Concrete
6. Section 16050 - Basic Electrical Materials and Methods
7. Section 16060 - Grounding
8. Section 16121 - Wire and Cable - 600 Volts and Below
9. Section 16122 - Medium Voltage Cables
10. Section 16130 - Electrical Raceway Systems
11. Section 16210 - Electric Service

**1.03 SYSTEM DESCRIPTION**

- A. Performance Requirements: Route conduits to allow pulling-in of conductors as indicated without exceeding the conductor's tension limits.

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electric Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data for conduits, manholes and handholes and all accessories.
- C. Contractor's Shop Drawings: Furnish working drawings for underground and ramp construction encased electrical raceway system showing conduits, concrete encasement, manholes, handholes, electrical equipment pads, junction and pull boxes and reinforcing. Indicate designation, type, size, location, elevations and slope.

## 1.05 PROJECT CONDITIONS

- A. Existing Conditions: Examine Record Drawings to determine the location of all obstructions along the conduit or cable route and at the sites of manholes, handholes and outdoor electrical equipment pads.
- B. Field Measurements: Field survey, and in critical areas, excavate test pits to verify locations of probable obstacles along the conduit or cable route and at the sites of manholes, handholes and outdoor electrical equipment pads.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

- 1. Conduit Spacers

- a. Prime Company
  - b. Underground Devices, Inc.

- 2. Manhole and Handhole Frames and Covers

- a. Neenah Foundry Co.

- 3. Buried warning tape

- a. Thomas & Betts
  - b. W. H. Brady Company

- 4. Manhole Accessories (pulling irons, cable rack and supports, insulators)

- a. Cooper Power Systems Division
  - b. A.B. Chance Company

## 2.02 MATERIALS

- A. Conduit: Provide conduits meeting the requirements of Section 16130 - Electrical Raceway Systems.
- B. Cable: Provide cables meeting the requirements of Sections 16121 - Wire and Cable - 600 Volts and Below and 16122 - Medium Voltage Cables.
- C. Spacers: Provide rigid plastic, conduit spacers to maintain conduit separation as indicated.

- D. Reinforcing Steel: Provide reinforcing steel meeting the requirements of Section 03200 - Concrete Reinforcement.
- E. Concrete: Provide concrete meeting the requirements of Section 03300 - Cast-In-Place Concrete. Dye all concrete used for duct bank encasements "red".
- F. Manhole Frames and Covers: Provide waterproof cast-iron manhole frame and solid bolted cover suitable for H-20 truck load. Cast the word "ELECTRIC" in the cover. Provide frame with a clear opening of 36 inches, unless otherwise shown.
- G. Grounding: Provide grounding meeting the requirements of Section 16060 - Grounding.
- H. Underground Warning Tape: Provide 6-inch wide detectable type plastic tape in red (electric), yellow (utility) and orange (communications) colors with suitable warning describing the type of buried electrical lines.

## 2.03 MANHOLE ACCESSORIES

- A. Pulling-in Irons: Provide pulling-in irons constructed of hot-forged, hot-dip galvanized steel.
- B. Cable Racks and Supports: Provide racks and supports constructed of heavy-duty, hot-dip galvanized steel.
- C. Insulators: Provide insulators made of high grade, dry process porcelain with smooth glazed surfaces.

## PART 3 EXECUTION

### 3.01 CONDUIT INSTALLATION

- A. General: Install underground, ramp and bridge encased, concrete encased and direct buried conduits as indicated. Coordinate closely with the ramp and bridge construction to assure adequate provisions for electric raceways concealed in those constructions.
- B. Conduit Route: Establish and mark exactly conduit or cable routing. Resolve routing near existing obstacles and coordinate with other sitework. Maintain a 12-inch minimum longitudinal clearance from the conduit bank encasement or direct buried conduit to adjacent utility lines. Maintain a 6-inch minimum vertical clearance from the conduit bank encasement or direct buried conduit to utility lines at crossovers. Adhere to lines, grades, elevations and dimensions as shown.
- C. Trench Excavation: Perform excavation work in accordance with the requirements of Section 02316 - Excavation.

- D. Workmat: Install concrete mat on trench bottom to provide an even base for concrete encased conduit bank in accordance with the requirements of Section 03300 - Cast-In-Place Concrete.
- E. Bedding: Provide a sand cover on trench bottoms for a firm and smooth surface for direct buried conduits.
- F. Spacers: Locate spacers at intervals of approximately four feet and stagger locations at each conduit tier to provide not less than 12 inches of longitudinal separation.
- G. Conduit: Place conduit in straight lines and with a minimum slope of 0.25 percent (3 inches per 100 feet). Slope conduit down to manholes, handholes, pull and junction boxes and structures. Install expansion fittings in straight runs exceeding 100-feet, coordinate with expansion joints in bridge and ramp structure. Secure conduits in place to prevent floating and movement.
- H. Bends: Install 12-foot minimum radius bends in horizontal turns and vertical deflections. For bends used at ends of conduit runs install elbows with 4-foot minimum radius for 6-inch and 5-inch conduits, and elbows with 3-foot minimum radius for 4-inch and smaller conduits.
- I. Inside Cleaning: Pull a standard flexible mandrel not less than 12-inches long, having a diameter approximately 1/4-inch less than the inside diameter of the conduit, through each conduit, then pull a brush with stiff bristles through each conduit. Replace conduit runs that do not allow the passage of the mandrel at no increase in Contract price. Use the pneumatic method to draw into conduit the nylon or polypropylene pull line. Plug and seal all conduits after cleaning.
- J. Concrete Reinforcing: Install concrete reinforcing meeting the requirements of Section 03200 - Concrete Reinforcement. Provide ductbanks with No. 5 reinforcing, spaced 12 inches on centers, top and bottom, with No. 3 ties at 18 inches, unless otherwise shown.
- K. Concrete Formwork: Install concrete formwork meeting the requirements of Section 03100 - Concrete Forms and Accessories.
- L. Outside Cleaning: Remove dirt, sand and debris around conduits and from workmat, prior to concrete placement.
- M. Concrete Placement: Place concrete meeting the requirements of Section 03300 - Cast-In-Place Concrete.
- N. Connections to Structures: Install as shown.
- O. Backfilling: Backfill meeting the requirements of Section 02317 - Backfilling. Provide a sand cover that is 6 inches over direct buried conduits or cables.

- P. Underground Warning Tape: Install one underground warning tape for each trench up to 18 inches wide. For trenches wider than 18 inches provide two underground warning tapes, one at each edge of the trench. Place the tape or tapes 12 inches below the finished grade.

### 3.02 MANHOLES AND HANDHOLES

- A. General: Provide cast-in-place reinforced concrete manholes and handholes as shown.
- B. Con Edison Manholes: Provide Con Edison electrical service manholes meeting the requirements of Con Edison and Section 16210 - Electrical Service.
- C. Location: Establish and mark manhole and handhole locations exactly. Resolve locations near existing obstacles and coordinate with other sitework. Adhere to orientation, elevations and dimensions as indicated.
- D. Manhole and Handhole Excavation: Install manhole and handhole excavations meeting the requirements of Section 02316 - Excavation.
- E. Cast-In-Place Manhole and Handhole Construction: Install cast-in-place manhole construction meeting the requirements of Sections 03200 - Concrete Reinforcement and 03300 - Cast-In-Place Concrete.
- F. Manhole Entrance: Install concrete rings and frame with cover. Adjust position of frame and cover to protrude 1-inch above adjacent unpaved ground or to be flush with the finished surface of pavement.
- G. Backfilling: Backfill meeting the requirements of Section 02317 - Backfilling.
- H. Accessories: Install pulling-in-irons, cable racks with supports and insulators, grounding system and other items as indicated.

### 3.03 OUTDOOR ELECTRICAL EQUIPMENT PADS

- A. General: Provide reinforced concrete pads for supporting Outdoor Electrical Equipment as shown.
- B. Location: Establish and mark pad locations exactly. Resolve locations near existing obstacles and coordinate with other sitework. Adhere to orientation, elevations and dimensions as shown.
- C. Site Excavation: Provide site excavation meeting the requirements of Section 02316 - Excavation.
- D. Pad Construction: Install pad construction meeting the requirements of Sections 03200 - Concrete Reinforcement and 03300 - Cast-In-Place Concrete.



- E. Conduit Entrances: Install conduit risers and laterals under pads prior to placement of pads. Separate conduits from pads as shown.
- F. Grounding: Install grounding conductors through pads meeting the requirements of Section 16060 – Grounding

**-END OF SECTION-**

**Section 16140**  
**WIRING DEVICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing wiring devices and appurtenances as indicated, in accordance with the Contract Documents.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16060 - Grounding
- B. Section 16130 - Electrical Raceway Systems
- C. Section 16745 - Telephone System

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. Fed Spec WC 596 - Electrical Power Connector, Plug, Receptacle And Cable Outlet
  - 2. Fed Spec WS 896 - Toggle and Lock, Flush Mounted Switches
  - 3. CSA C22.2-182.1 - Industrial-type, Special-Use Attachment Plugs, Receptacles and Connectors
  - 4. UL 20 - General - Use Snap Switches
  - 5. UL 498 - Attachment Plugs and Receptacles
  - 6. UL 508 - Industrial Control Equipment

**1.04 SPARE PARTS**

- A. Furnish the following spare parts from the manufacturer approved and supplied for this project.
  - 1. Five 15-ampere, 125-volt, 2-pole, 3-wire grounding type plugs, NEMA 5-15P nylon housing, Hubbell Cat. No. HBL5266C or approved equal
  - 2. Twenty 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, nylon housing, Hubbell Cat. No. HBL5366C or approved equal

3. Ten 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, corrosion resistant, yellow nylon housing, Hubbell Cat No. HBL 53CM66C or approved equal
  4. Six 60-ampere, 600-volt, 3-pole, 4-wire plugs, thermoplastic non-metallic housing with metallic shroud and locking ring providing a NEMA 4X seal when mated with the receptacle, Hubbell Cat No. HBL460PS2W or approved equal. Provide cord grips suitable for servicing the cables for pressure washer. Install 2 plugs as described in Part 3.
  5. Ten percent but not less than 5 matching plugs for each type and rating of receptacles furnished
- B. Packaging: Package spare parts in containers bearing labels clearly designating contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory packages.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Standard of Quality and General Configuration: Use of manufacturer's name and model or catalog number in this Section is for the purpose of establishing the desired quality and characteristic. Equivalent products of other manufacturers may be submitted for approval.
- B. Configuration and Rating: Provide NEMA specification grade wiring devices in the type, color, configuration and electrical rating for the service indicated.
- C. Symbols: See the electrical symbol list shown for identification of all device types.
- D. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  1. Hubbell Inc. Wiring Device/Kellems Division
  2. Bryant
  3. Pass and Seymour
  4. Cooper Wiring Devices
  5. Leviton
  6. Tork
  7. Tay Mac Corporation
  8. Thomas & Betts

### 2.02 LIGHTING TOGGLE SWITCHES

- A. Provide toggle switches of specification grade rated 20- amperes, 120-277 volts ac conforming to Fed. Spec. WS 896 and UL Standard 20. Manufacture switches with back and side wired binding screw type terminals, one piece spring contact

arm and terminal plate with silver alloy contacts, one piece steel mounting strap with an assured grounding clip, thermoset body color coded for identification by amperage and a brown toggle. Provide ivory toggles in finished areas.

- B. Types. Equivalent products of other manufacturers may be submitted for approval.

<u>DESCRIPTION</u>	<u>HUBBELL CAT. NO.</u>
Single pole	HBL1221
Two pole	HBL1222
Three way	HBL1223
Four way	HBL1224
SPDT center off momentary contact	HBL1557

- C. Accessories: Provide a flush neon "ON" pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify equipment controlled.

## 2.03 AC MANUAL MOTOR STARTING SWITCHES

- A. Provide ac manual motor starting switches where overload protection is not required or is provided separately. Provide switches similar in construction to the lighting toggle switches except conforming to UL 508 and rated 30-amperes, 120-277 volts ac.
- B. Types. Equivalent products of other manufacturers may be submitted for approval.

<u>DESCRIPTION</u>	<u>HUBBELL CAT. NO.</u>
Single pole	HBL-3031
Double pole	HBL-3032

- C. Accessories: Provide a flush neon "ON" pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify the equipment being controlled.

## 2.04 CONVENIENCE RECEPTACLES

- A. Provide specification grade convenience receptacles conforming to Fed. Spec. WC 596 UL listed, with nylon impact resistant face, one piece metal wrap around mounting strap with assured grounding clip, back and side wired binding screw type terminals, brass power contacts and a heavy duty heat stabilized thermoset plastic base. Provide brown devices in unfinished areas and ivory devices in finished areas unless otherwise specified.

- B. Types. Equivalent products of other manufacturers may be submitted for approval.

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Single	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	HBL5361/ HBL5361I
Duplex	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	HBL5362/ HBL5362I
Single- corrosion- resistant	NEMA 5-20R 20A, 125V, 2P, 3W	Yellow	HBL53CM61
Duplex- corrosion- resistant	NEMA 5-20R 20A, 125V, 2P, 3W	Yellow	HBL53CM62
Single	NEMA 6-20R 20A, 250V, 2P, 3W	Brown/ Ivory	HBL5461/ HBL5461I
Duplex	NEMA 6-20R 20A, 250V, 2P, 3W	Brown/ Ivory	HBL5462/ HBL5462I
Quadraplex	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	HBL420H/ HBL420HI

## 2.05 SPECIAL USE RECEPTACLES

- A. Provide special use receptacles of specification grade in accordance with applicable Fed. Specs, UL, ANSI and CSA Standards.
- B. Type. Equivalent products of other manufacturers may be submitted for approval.

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Duplex-ground fault circuit interrupter	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	GF5352L/ GF5352IL
Single-isolated ground	NEMA 5-20R 20A, 125V, 2P, 3W	Orange	IG5361
Duplex-isolated ground	NEMA 5-20R 20A, 125V, 2P, 3W	Orange	IG5362

<u>DESCRIPTION</u>	<u>RATING</u>	<u>COLOR</u>	<u>HUBBELL CAT. NO.</u>
Duplex – surge suppression w/isolated ground	NEMA 5-20R 20A, 125V, 2P, 3W	Blue	IG5352S

## 2.06 TELEPHONE/DATA COMMUNICATIONS OUTLETS

- A. Provide telephone/data communication outlets meeting the requirements of Section 16745 – Telephone System.

## 2.07 PRESSURE WASHER RECEPTACLES

- A. Provide pressure washer receptacles complete with fusible mechanically interlocked switch, receptacle, angle adapter, threaded cap. Provide the receptacle assembly that meets the requirements for NEMA 4X enclosures constructed from a thermoplastic non-metal material. Provide properly sized Class “J” fuses

- B. Types

<u>DESCRIPTION</u>	<u>RATING</u>	<u>HUBBELL CAT. NO. or approved equal</u>
Single receptacle	60A, 600V, 3P, 4W	HBL460MIFS2W

## 2.08 WELDING RECEPTACLES.

- A. General: Provide welding receptacles complete with mechanically interlocked disconnect switch, receptacle, angle adaptor and threaded cap attached to the device with a strap. Provide the assembly that meets the requirements for a NEMA 4X rating. Construct the assembly from a thermoplastic material.

- B. Types

<u>DESCRIPTION</u>	<u>RATING</u>	<u>HUBBELL CAT. NO. or approved equal</u>
Single receptacle	30A, 600V, 3P, W.GRND	HBL430MIS2W

## 2.09 FLOOR BOXES

- A. Floor Boxes: Provide cast iron floor boxes with corrosion resistant finish and fully adjustable tops to permit both vertical and angular adjustment before and after concrete is placed.

- B. Flush Covers: Provide brass flush floor box cover suitable for the devices shown. Furnish brass carpet flanges as required.
- C. Above Floor Fittings: Provide low profile above floor fitting consisting of aluminum housing and stainless steel plates suitable for the devices shown.
- D. Types. Equivalent products of other manufacturers may be submitted for approval.

DESCRIPTION	HUBBELL CAT. NO.
Single gang rectangular floor box	B2436
Two gang rectangular floor boxes	B4233
Three gang rectangular floor boxes	B4333
Rectangular flush cover for duplex receptacle	S3825
Rectangular flush cover for single receptacle or above floor fitting	S2625
Single gang rectangular carpet flange	SB3083
Two gang rectangular carpet flange	SB3084
Three gang rectangular carpet flange	SB3085
Above floor service fitting	SC3099
Duplex receptacle plate	SS309D
Single receptacle plate	SS309S
Ground fault receptacle plate	SS309DS
Telephone Bushing plate	SS309T
Blank plate	SS309B

## 2.10 OUTLET BOXES

- A. Provide outlet boxes in accordance with the requirements specified in Section 16130 - Electrical Raceway Systems.

## 2.11 PLATES AND COVERS

- A. Provide covers and plates for the various areas as follows:
  1. Architectural Finished Areas: Provide Type 302/304 stainless steel plates and covers for devices.
  2. Areas Below Grade, Corrosive and Wet Areas
    - a. For switches provide weatherproof, gasketed, covers with external operating handle.
    - b. For receptacles provide a weatherproof, gasketed, clear, flame-retardant, jumbo, polycarbonate cover a minimum of 5.4-inches deep,

suitable for use with a 10-3 cord that allows the cover to be closed even when the receptacle is in use.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install all wiring devices in accordance with manufacturer's recommendations and approved shop drawings as specified in Division 1.
- B. Toggle Switches: Install toggle switches applicable for the area environment for switching lighting or other branch circuit loads.
- C. Receptacles: Install receptacles applicable for the area environment.
- D. Grounding: Ground all devices in accordance with the requirements specified in Section 16060 - Grounding.
- E. Plug Installation: Install plugs on the cables for the following equipment:
  - 1. Pressure Washers Equipment
    - a. Ratings: 60A, 480V, 3P, 4W
    - b. Quantity: 1
  - 2. Portable Welding Equipment
    - a. Ratings: 30A, 480V, 3P, GND
    - b. Quantity: 3

-END OF SECTION-



**NO TEXT ON THIS PAGE**

**Section 16210**  
**ELECTRIC SERVICE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish and install electric service system including service manholes, conduits, cables, current transformer cabinets, meter bases, blockhouse components and accessories as required for a complete installation in accordance with the Contract Drawings and Con Edison requirements.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16085 - Short Circuit and Coordination Study
- B. Section 16121 - Wires and Cables – 600 Volts and Below
- C. Section 16122 - Medium Voltage Cables
- D. Section 16130 - Electrical Raceway Systems
- E. Section 16132 - Underground Electrical Distribution System
- F. Section 16430 – 480 Volt Switchgear
- G. ConEd - Block house drawings and related specifications

**1.03 SUBMITTALS**

- A. General: Provide all submittals, including the following, as specified in Section 01330 – Shop Drawings.
- B. Correspondence: Furnish copies of all correspondence with Con Edison including available short circuit currents and X/R ratings for each feeder.
- C. Con Edison Drawings: Furnish Con Edison prepared drawings.
- D. Manufacturer's catalog data sheets for all products.

**1.04 SYSTEM DESCRIPTION**

- A. Service for the facility shall consist of two 3000 ampere feeds rated 480/277 Volt, three-phase, four-wire. The feeds will be derived from the Con Edison secondary network bus located in the new Utility block house, constructed as a part of this project. The service feeds shall extend into unscramble manholes EMH-1A & 1B near the blockhouse. The short circuit capacity at the secondary network bus located in the Blockhouse may be as much as 200,000 Amperes.
- B. The facility services will be connected to the ConEd 480 volt service feeds in manhole EMH-2A & 2B respectively. They shall extend, as shown on Contract Drawings, to the facility. Upon entering the footprint of the facility they will run under the pier level, above the pit topping slab, below the grade and support beams,

to Electric Room 1- where they will terminate in the Utility structures at each end of the Facility main switchgear.

- C. Primary, medium voltage feeders shall extend from the property line manholes EMH-1A & 1B respectively to the termination at the Utilities transformers, which are located in the Blockhouse.

#### 1.05 QUALITY ASSURANCE

- A. Contact the following Con Edison representative for specific instructions regarding electric service requirements at this facility before commencing work:

Mr. Brian Mcardle  
Customer Project Manager Consolidated Edison of New York,  
30 Flatbush Ave, 6/F  
Brooklyn, NY 11217  
Telephone number is 718-802-6386

- B. Completed installation must comply with all applicable Con Edison standards and requirements and receive Con Edison approval.

#### 1.06 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. Deliver all materials in good condition. Store in dry place until installation.

### PART 2 PRODUCTS

#### 2.01 GENERAL

- A. Provide all equipment and material not furnished by Con Edison that are needed to complete the electrical work shown in the blockhouse. Install all equipment required for the blockhouse furnished but not installed by Con Edison. All equipment and material shall conform to Con Edison "Requirements for Electric Service Installations" and all pertinent Con Edison specifications.

#### 2.02 CON EDISON METERING

- A. Revenue Meters: Meters will be furnished by Con Edison.
- B. Meter Base: Provide meter base and wiring to the Utility Metering Structure in accordance with the requirements of Con Edison.

#### 2.03 CON EDISON REQUIRMENTS

- A. All equipment and material shall conform to Con Edison "Requirements for Electric Service Installations", the Con Edison drawings issued for this installation

that are attached to the Contract Documents and all pertinent Con Edison specifications and standards.

- B. Certain equipment will be furnished by Con Edison for installation by the Contractor.

#### 2.04 SERVICE MANHOLES

- A. Customer service (property line) manholes shall be Con Edison Type M11-6 pre-cast concrete with interior dimensions of 11'-6" x 4'-6" x 6'-6" in accordance with Con Edison Spec EO-2164-B. Secondary (EMH) manholes adjacent to the Blockhouse shall also meet Con Edison requirements.
- B. All manhole depths shall be subject to duct bank slope requirements and shall be approved by Con Edison.

#### 2.05 UTILITY METERING STRUCTURES

- A. Provide utility metering structures at each end of the MTS 480-volt switchgear.
- B. The structure shall contain incoming service cable lugs, utility metering transformers, metering and protective devices.
- C. Structures shall have full capacity copper bus from the incoming cable lugs to the 480-volt switchgear connection. Cable lugs material shall be copper.
- D. The structures shall have a continuous ground bus that shall extend to the 480-volt switchgear ground bus.
- E. The structures shall contain provisions and protection for communication equipment and connections needed for the Utility to read the meters remotely.
- F. The structures shall conform to Con Edison requirements and shall match the adjacent switchgear in construction and appearance.
- G. Current Transformer (CT) cabinets shall meet Con Edison Spec 377 and shall be rated 2500-4000 Amperes.

#### 2.06 WIRE AND CABLE.

- A. Provide primary cable in compliance with the requirements of Specification Section 16122 for connection between the Con Edison property line manholes and the Blockhouse Transformers.
- B. Provide secondary cable in compliance with the requirements of Specification Section 16121 for connection from the Con Edison Blockhouse to the Main Switchgear in the Facility.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. Con Edison Arrangements: The Contractor shall make arrangements with Con Edison to obtain permanent electric service to the Project and pay for any charges approved by City of New York associated with the service procurement.
- B. Coordination: Coordinate schedule of Con Edison facilities with all other work.
- C. Con Edison System Information: Obtain all information required to perform the Short Circuit and Coordination Study specified in Section 16085 - Short Circuit and Coordination Study.

**3.02 INSTALLATION**

Customer service primary property line and blockhouse secondary manholes shall be located where indicated on the Contract Drawings for termination of primary and secondary cables. These manholes and any underground duct connecting to the locations shall be provided by the Contractor.

- A. Install all equipment and accessories in the Con Edison blockhouse in accordance with Con Edison requirements and the Contract Drawings.
- B. CT cabinets and metering shall be located in the MTS Electrical Room. Meters shall be furnished by Con Edison.
- C. Primary cable shall be provided by the Contractor. The primary cable connection to the Con Edison System in the property line manhole shall be by Con Edison.

-END OF SECTION-

**Section 16220**  
**ELECTRIC MOTORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for electric motors as specified.

**1.02 RELATED SPECIFICATIONS**

1. Section 09912 - Interior Painting
2. Section 16050 - Basic Electrical Materials and Methods
3. Section 16055 - Electrical Requirements for Shop Assembled Equipment
4. Section 16060 - Grounding
5. Section 16075 - Electrical Identification
6. Section 16130 - Electrical Raceway Systems

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. AFBMA 10 - Metal Balls
2. NEMA CP1 - Shunt Capacitors
3. NEMA MG1 - Motors and Generators
4. NEC - National Electrical Code
5. NYCBC - New York City Building Code
6. NYSEC - New York State Energy Code
7. EPAC 2007 - Energy Policy Act 2007

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's catalog data for each motor.
- C. Shop Drawings: Furnish shop drawings for each motor detailing arrangement, wiring, conduit boxes, and motor application.
- D. Certificate of Compatibility: For each motor controlled by an adjustable frequency drive, furnish a certificate that the motors are compatible with the adjustable frequency drives and the equipment loads to be driven.

E. Quality Control: Furnish test reports for motors as follows:

1. Certified standard commercial test reports for motors 5 hp through 200 hp
2. Actual shop test reports for motors over 200 hp
3. Witnessed test reports as specified

F. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for all motors as specified in Section 01831.

1.05 QUALITY ASSURANCE

- A. Codes: Comply with local codes and all other applicable codes.
- B. Regulatory Requirements: Comply with requirements of the Regulatory Agencies having jurisdiction over this Project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. General Electric Company
2. Magnetek
3. Reliance Electric
4. Siemens
5. U.S. Electrical Motors
6. TECO/Westinghouse Corp.

2.02 MATERIALS

- A. General: Provide motors and accessories with the equipment as specified under the equipment sections.
- B. Motor Requirements: Unless otherwise specified, provide motors as follows:
1. Polyphase motors of the high energy efficiency and high power factor type.
  2. Motor nameplate horsepower as specified for the driven equipment.
  3. Motors that operate continuously over the entire load range of the driven equipment without loading motor in excess of nameplate rating and its specified temperature limit.
  4. For motors rated over ½ hp, operating at 460 volts, 3-phase, 60-hertz, provide squirrel cage induction type.
  5. For motors less than ½ hp, provide 115-volt, single phase, 60-hertz type.

6. Motors suitable for continuous operation with a line voltage variation within  $\pm 10$ -percent of rated voltage.
7. Motors that operate continuously in a 40 degrees C ambient.
8. Inverter duty motors when powered from an adjustable frequency drive.

C. Frequent Start Requirements: Provide motors for frequent starting as specified.

## 2.03 MECHANICAL PROTECTION

### A. Indoor Locations

1. For motors located in dry, clean and well ventilated areas provide open drip-proof type.
2. For motors located below grade, provide totally-enclosed, fan-cooled type with removable drain plug.
3. For motors located in wet, damp or dusty areas, provide totally-enclosed, fan-cooled type with removable drain plug.
4. In corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown, provide totally-enclosed, fan-cooled, Mill and Chemical Duty type, with removable drain plug.

B. Outdoor Locations: For motors located outdoors, provide a totally-enclosed, fan-cooled Mill and Chemical Duty type, with removable drain plug.

C. Submersible Locations: For operation in a submersible location, provide a completely sealed submersible motor.

## 2.04 BOXES

A. Provide oversized conduit boxes on motors to facilitate conductor installation and auxiliary components as required.

1. Make conduit box enclosure ratings (NEMA) compatible with motor enclosures.
2. Where shown, provide additional space in the power terminal box for the mounting and wiring of the current transformers furnished under the motor protection and monitoring systems.



**2.05 NEMA DESIGN AND INSULATION**

- A. Design Classification: Provide NEMA Design B, unless otherwise specified, with NEMA Class F moisture resistant insulation and NEMA Class B, 80 degrees C temperature rise at rated nameplate load.
- B. Variable Speed Operation: Provide insulation to protect against adverse affects of a nonsinusoidal waveform.

**2.06 WINDINGS**

- A. Provide copper windings and rotor bars, unless otherwise specified.

**2.07 BEARINGS**

- A. Ball and Roller Bearings: Use antifriction ball or roller type bearings at manufacturer's option, unless otherwise specified.
- B. Regreasable Bearings: Use regreasable bearings with support side thrust loadings, with an AFBMA B-10 bearing life rated at least 100,000 hours, based on a reliability of 90 percent.

**2.08 SERVICE FACTOR AND LOADINGS**

- A. Service Factor: Provide 1.15 service factor for sinusoidal voltage waveforms and 1.0 for nonsinusoidal voltage waveforms unless otherwise specified. Where motors with a 1.0 service factor are furnished, provide motors rated at least 15 percent greater than required brake horsepower.
- B. Shaft Loading: Provide steady state shaft loading not to exceed 100 percent of full load rating under maximum load, excluding the service factor, unless otherwise specified.

**2.09 SPEED**

- A. General: Provide motor speed as specified for the driven equipment.
- B. Multispeed: Provide multispeed motors as specified for the driven equipment.
- C. Adjustable Speed: Provide motors specifically designed and rated for use with the adjustable speed device furnished.

**2.10 TORQUE**

- A. General: Provide breakdown torque of 200 percent or more of motor full load torque.

- B. Locked Rotor: Provide locked rotor torque of 80 percent or more of motor full load torque.
- C. Inertia: Provide necessary  $WK^2$  data for special loads to coordinate with motors.
- D. Special Motors: Supply special motors where torque requirements exceed standard design.

## 2.11 SLIDE RAILS AND SOLE PLATES

- A. Provide slide rails and sole plates as required for proper installation.

## 2.12 SINGLE PHASE FRACTIONAL HORSEPOWER MOTORS

- A. Provide capacitor or open split phase start, for smaller than 1/2 hp motors unless otherwise specified.

## 2.13 THREE-PHASE MOTORS

- A. Induction Motors: Provide horizontal or vertical squirrel cage induction motors for continuous duty with full voltage starting except as otherwise specified.

## 2.14 EFFICIENCY

- A. Provide motor meeting the requirements of EPAC 2007 for General Purpose Electric Motors Sub Type I and II. See NEMA MG-1 Table of Full Load Efficiencies of Premium Energy Efficient Motors. Refer to Tables 12.12 (Sub Type I) and 12.11 (Sub Type II).

## 2.15 POWER FACTOR

- A. Provide motors having the following minimum power factor ratings:

Motor Power Factor Minimum		
Horsepower	Percent	
	At 1800 RPM Power Factor	At 1200 RPM Power Factor
1	74.3	69.7
1-1/2	76.5	62.0
2	70.3	70.1
3	79.9	73.7
5	83.8	75.8
7-1/2	82.4	78.2
10	85.0	76.4
15	85.0	81.1
20	84.6	81.9
25	84.5	82.0

Motor Power Factor Minimum		
Horsepower	Percent	
	At 1800 RPM Power Factor	At 1200 RPM Power Factor
30	84.2	82.5
40	84.2	83.3
50	85.0	84.9
60	86.8	85.7
75	86.6	86.0

## 2.16 NOISE

- A. Limit motor machine noise to sound power levels listed in NEMA MG 1-12.

## 2.17 ACCESSORIES

- A. Identification: Provide identification meeting the requirements with Section 16075 - Electrical Identification.
- B. Space Heaters: Where specified or shown, provide motor space heaters to prevent moisture condensation when the motor is not operating. Provide space heaters suitable for 115-volt, single phase, 60-hertz operation.
- C. Thermal Detectors: Where specified or shown, provide motor winding temperature switches or thermal devices.

## 2.18 SOURCE QUALITY CONTROL

- A. Shop Tests: Perform actual job motor shop tests for motors over 200 hp. Include standard commercial and additional tests listed below, and special tests listed in other sections.
- B. Standard Commercial Tests: Perform the following tests in accordance with NEMA standards.
1. No load running current and speed
  2. Locked rotor current
  3. Dielectric routine tests
  4. Motor efficiency tests
  5. Motor power factor tests
- C. Additional Testing: Perform the following additional tests in accordance with NEMA standards.
1. Winding resistance
  2. Bearing inspection

3. Power factor at full,  $\frac{3}{4}$  and  $\frac{1}{2}$  load
4. Efficiency at full,  $\frac{3}{4}$  and  $\frac{1}{2}$  load
5. Motor starting torque

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install motors in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Make all necessary adjustments to equipment to provide a complete operational system.

#### 3.02 FIELD QUALITY CONTROL

- A. Inspections and Tests: Perform field preliminary and final inspection and testing for motors as specified in Section 01811 and as follows:

1. Preliminary Inspection

- a. Demonstrate that each motor has been properly connected.
- b. Check for proper rotation by bumping prior to connecting motor to driven equipment.

2. Final Test

- a. Measure motor applied voltage and current with equipment operating at full load.
- b. Operate equipment as specified.

#### 3.03 CLEANING AND PAINTING

- A. Shop Painting: Paint the motors in accordance with the requirements of Section 09912 - Interior Painting.
- B. Field Painting: Clean and touch up marred surfaces to match the original finish.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 16230**  
**PACKAGED ENGINE GENERATOR SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing packaged industrial engine generator systems rated 750kW, 480-volt, 3-phase, 60 Hz to supply emergency and standby electrical power as specified and shown. Each system consists of:
1. Diesel engine-driven generator and radiator mounted on a structural steel base
  2. Exhaust silencer and fittings
  3. Sub-base fuel storage tank, fuel pipelines and fittings
  4. Generator control and instrument panel with annunciator
  5. Generator distribution panel
  6. Battery and charger including battery rack
  7. 480-volt load center
  8. 480-208Y/120-volt transformer
  9. 208Y/120-volt load center
  10. Starters and contactors for control of auxiliary equipment
  11. Jacket water heaters
  12. Vibration isolators
  13. Weather protective enclosure
  14. Load bank
  15. Fuel Quality Maintenance System

**1.02 RELATED SPECIFICATIONS**

1. Section 01821 – Training
2. Section 09912 - Interior Painting
3. Section 11141 – Diesel Fuel Dispensing System
4. Section 15191 – Diesel Fuel Piping
5. Section 16050 - Basic Electrical Materials and Methods
6. Section 16075 - Electrical Identification
7. Section 16085 – Short Circuit and Coordination Study
8. Section 16121 – Wires and Cables – 600 Volts and Below

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. ASTM A 185 - Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
2. ASTM A 615/A615M - Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement

3. NFPA 30 - Flammable and Combustible Liquids Code
4. NFPA 110 - Emergency and Standby Power Systems
5. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids
6. UL 508 - Electrical Panel Construction Methods
7. NEMA MG-1 - Motors and Generators
8. EGSA 101 - Engine Driven Generating Sets
9. NYCBC - New York City Building Code
10. EPA - Environmental Protection Agency

#### 1.04 SYSTEM DESCRIPTION

- A. The generator unit is to function as an emergency/standby power source for use in the event of failure of the incoming normal power service and during normal exercising operations. Each unit consists of a diesel engine-driven generator mounted on a structural steel base, complete with generator control and instrument panel with integral annunciator, generator circuit breaker, starting battery(s) and charger with battery rack, governor, engine jacket-water cooling system, exhaust silencer, radiator, voltage regulator, weather protective enclosure, dual wall sub-base fuel storage tank with leak detection and monitoring and all appurtenances necessary for a complete functioning engine generation system. Size each sub-base fuel storage tank to provide 24-hours of continuous operation at the generator's full load capacity.
- B. Provide a minimum generator capacity of 750 kW at 480 volts, 3-phase, 60 hertz, 0.8 power factor and 1800 rpm; at an ambient temperature ranging between -20 degrees to 105 degrees F.
- C. Provide a fuel recirculation and filter system to maintain the quality of the engine fuel supply in the storage tank.

#### 1.05 SUBMITTALS

- A. General: Furnish all submittals including the following as required in Section 16050 – Basic Electrical Materials and Methods.
  1. Furnish starting battery sizing calculations.
  2. Acoustic control calculations for outside the enclosure.
  3. Seismic support calculations.

4. Engine certificate of compliance to latest EPA requirements.
  5. Provide a chart that shows practical steps necessary to permit the engine-generator to start the required loads without exceeding permissible voltage and frequency limits – while maintaining any loads already started, in running condition.
- B. Product Data and Information: Furnish product data and information showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, generator control and instrument panel with integral annunciator, load bank, battery, battery rack, battery charger, exhaust silencer, vibration isolators, sub-base fuel storage tank with leak monitor and cooling system. Supply product data and information for the fuel recirculation system with interconnecting piping. Also supply product data and information for the generator set enclosure with auxiliary systems.
- C. Contractor's Shop Drawings: Furnish Contractor's shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams. Also furnish plans and information for the fuel recirculation equipment and for the generator set enclosure.
- D. Quality Control
1. Provide engine generator equipment, installation and testing in compliance with the requirements of NFPA 110 and the EGSA 101 series performance standards.
  2. Furnish the manufacturer's certified, shop-test report including the following tests:
    - a. Generator tests in accordance with IEEE Test Code for synchronous machines including heat run at rated output, insulation resistance and high potential.
    - b. Engine generator tests in accordance with specifications including the following:
      - (1) Two hours continuous operation at full load
      - (2) One-half hour at 75 percent of full load
      - (3) One-half hour at 50 percent of full load
  3. Furnish test reports indicating voltage, amperes, kilovolt-amperes, kilowatts, rpm and fuel consumption for each load condition as curves; and containing statements on temperature rise of oil and cooling water, vibration and other objectionable performance conditions. Furnish test data showing voltage drop



and frequency fluctuations when block loads are added and removed in 25 percent, 50 percent, 75 percent and 100 percent increments.

4. Furnish manufacturer's installation instructions.
  5. Items D2 and D3 above shall be submitted and approved before the engine-generator may be shipped to the job site.
- E. Operation and Maintenance Manuals: Furnish manufacturer's operation and maintenance manuals.
- F. Record Drawings: Furnish Record Drawings, in accordance with the provisions in Section 01332, accurately indicating the locations of engine generator, load bank, output circuit breakers, batteries, battery charger, equipment mounted in the enclosure, fuel connections, vents, fuel recirculation cabinet and engine generator enclosure including mechanical and electrical connections.

#### 1.06 WARRANTY

- A. Furnish a written manufacturer's warranty for a period of not less than two years from the date of acceptance of the system covering, but not limited to, the following:
1. Repair parts
  2. Labor
  3. Travel expense
  4. Expendables made unusable by the defect and used during a repair

#### 1.07 SPARE PARTS

- A. Furnish the following spare parts:
1. Two auxiliary relays and contactors of each type used
  2. Two fuse replacements of each type used
  3. Two replacements of all types of indicating lamps and color caps used
  4. Two time delay relays of each type used
  5. One current transformer of each type used
  6. One potential transformer of each type used
  7. Two Start/Stop push buttons and selector switch of each type used
  8. One automatic voltage regulator
  9. Three full sets of fuel, air and oil filters
  10. Two complete sets of V-belts
  11. One compression tester
  12. One complete set of maintenance manuals
  13. One complete set of parts manuals
  14. Three 12-ounce spray cans of the final finish for touch-up

- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Engine generator set and accessories

- a. Caterpillar Inc.
- b. Cummins Power Generation

2. Generator Circuit Breakers

- a. General Electric Company
- b. Cutler-Hammer

3. Battery and Charger

- a. Alcad Inc.
- b. Chloride Inc.
- c. SAFT Nife

4. Load Bank

- a. Professional Power Products, Inc.
- b. SEPHCO

5. Engine Generator Enclosures

- a. Caterpillar Inc.
- b. Cummins
- c. Professional Power Products

6. Fuel Recirculation System

- a. RCI

### 2.02 MATERIALS

- A. Engine: Provide water-cooled, vee type EPA approved diesel engine, 12 cylinders turbo-charged, four-stroke cycle, compression ignition type operating on EPA approved diesel fuel oil. Provide an engine equipped with fuel, lube-oil and air-intake filters with replaceable elements; lube-oil cooler, gear-driven coolant pump,

fuel-priming pump, fuel-transfer pump, engine-jacket water heater and pressure relief and bypass valves. Provide an engine having exhaust-valve seats replaceable with inserts. Provide the engine directly connected to the generator and the set mounted on a common structural-steel base through suitable, spring type, vibration isolators selected for the seismic conditions at this location.

1. Engine fuel/water separator: Provide a fuel/water separator mounted ahead of the fuel pump on the engine generator set to remove fuel tank condensation and to prevent water from entering the engine fuel system.
2. Engine Lubrication: Provide an engine-driven, gear-type, lubricating oil pump with removable suction screen to force oil under pressure to all main, connecting rod, piston, wrist pin and cam shaft bearings, timing gears and governor operating mechanism. Provide a full-flow, lubrication oil filter of the replaceable cartridge type and lubrication oil cooler for the engine. Provide a bypass valve in the filter assembly to allow engine lubrication in case the filter is clogged. Fill the engine crank case with approved lubricating oil in accordance with the manufacturer's instruction.
3. Engine Speed Governor: Provide an electronic, isochronous governor to control the engine speed and maintain a steady-state frequency regulation within  $\pm 0.25$  percent (0.15 hertz) from no load to full load.
4. Engine Jacket Water Heater: Provide an engine-mounted, thermal circulation type water heater incorporating a thermostatic switch to maintain the engine jacket water at 90 degrees F. Provide two heaters (one heater per each bank of cylinders), suitable for operation on 480 volts, 60 hertz.
5. Engine Generator Support Systems Power: Provide a 480-volt load center, a 480V-208Y/120V transformer and 208Y/120-volt load center to serve the total auxiliary generator loads, all enclosure and fuel recirculation needs. Provide all starters and contactor required to control jacket water heater, fans, space, generator, fuel and battery heaters and unit heaters.
6. Engine Exhaust Pipe and Silencer: Provide an exhaust pipe and silencer suitable for this installation, fabricated of welded Schedule 40 steel pipe and sweep elbows with the horizontal piping pitching downward away from the engine. Provide No. 316 stainless steel flexible connectors to connect the engine exhaust silencer and exhaust stack. Provide a valved silencer drain with a drip pocket having a minimum capacity of two gallons. Provide "Metal-On" insulation a minimum 2-inch thick with aluminum cover over exhaust pipe and silencer. Exhaust noise and other enclosure noises shall be within the limits set by the NYC Noise Control Ordinances.

7. Engine Jacket Cooling System: Provide a corrosion-inhibited cooling solution of water and ethylene glycol rated for 40 degrees F operating temperature for the cooling system.
  - a. Engine mounted radiator: Equip the engine with an engine-mounted radiator, direct drive blower fan and close fitting shroud, sized to provide cooling for the engine jacket water, lubricating oil and after-cooler water cooling requirements. Provide a rigid guard to enclose both the top and sides of all moving parts between the engine and the radiator. Provide the radiator with a duct flange.
8. Engine shall be capable of supporting the full capacity of the generator, including overload.

B. Generator

1. Provide generator rated for continuous standby service 750 kW, 937 kVA at 0.8 power factor, 480 volts, three phase, four wire, wye connected, 60 Hertz, 1800 rpm, with a temperature rise not exceeding 150 degrees C in an ambient temperature of 40 degrees C.
2. Provide generator as a 4 pole, salient pole, synchronous, revolving field, static regulated, brushless exciter with Class F insulation in a totally enclosed fan-cooled enclosure connected to the engine through a flexible coupling and a ring bolted to the flywheel housing.
3. Provide generator with the rotor dynamically balanced within .0005 in. peak-to-peak amplitude displacements at both ends of the shaft, capable of sustaining 25 percent overspeed.
4. Provide generator with stator and rotor windings of copper and in the layered form wound design with amortisseur windings furnished in pole faces having welded-type connections. Generator construction and windings shall suppress all odd harmonics.
5. Provide generator excitation system consisting of a rotating rectifier assembly, 3-phase ac exciter and solid-state voltage regulator. Provide exciters that consist of a stationary field structure and a revolving armature. Provide surge suppressors to protect the rotating rectifiers. Provide excitation support for improved short circuit performance.
6. Provide generator capable of withstanding 10 percent overload current for two hours and 50 percent overload current for one minute without injurious heating at the rated power factor and the exciter field set for normal rated load excitation.

7. Provide generator having a minimum combined efficiency of 95 percent with the exciter and voltage regulator at rated, full-load current.
8. Provide generator, exciter and regulator with radio and TV noise suppression.
9. Provide generator with adequate SCKVA to start all emergency and Switchgear B bus loads while maintaining adequate voltage and frequency.
10. Provide heaters as needed to prevent moisture from deteriorating the Generator insulation during periods of non-use.

C. Automatic Voltage Regulator

1. Provide an automatic, high-speed, solid-state, static voltage regulator mounted in the generator control panel arranged to monitor the generator output voltage in all three phases and apply corrections to generator excitation for variations in the voltage due to changes in generator load current, engine speed and load power factor.
2. Provide the voltage regulator to maintain generator output voltage within plus or minus one percent of the rated voltage from no load to full load, and momentary voltage drop at a maximum of 20 percent of rated voltage when full load is applied.

D. Generator Output Distribution Panel: Provide a generator output distribution panel consisting of one power bus feeding two separate partitioned areas with individual door covers. One area shall serve Emergency loads. The other area Normal loads. The Emergency side shall contain the Fire Pump Controller feed circuit breaker and a set of lugs to feed a remote Fire Alarm disconnect switch. The normal side shall contain two circuit breakers. One to feed the B bus of the switchgear and the other to feed the load Bank. All shall be arranged in Hot Sequence per NYCEC.

1. Provide one low-voltage, power circuit breakers rated at 1200 T/1600F amperes at 480 volts, 3-phase, 60-hertz to serve the 480 main switchgear B bus.
2. Provide one low-voltage, power circuit breakers rated at 400T/600F amperes at 480 volts, 3-phase, 60-hertz to serve the fire pump controller automatic transfer switch
3. Provide one 600T/800F ampere low voltage power circuit breaker rated at 480 volts, 3 phase, 60-hertz to serve the Load Bank.
4. Provide a 3 phase set of lugs to supply a feed to the remote fire alarm system disconnect switch.
5. Provide circuit breaker protection programming set points selectively coordinated with the loads served that will protect the generator from damage

and allow downstream O/C devices to interrupt overloads and faults without taking the Generator off-line..

6. Provide instrument and relay current transformers and potential transformers with as required within the structure housing the circuit breaker.
- E. Load Bank: Provide an integral load bank rated at 50 percent of generator capacity to provide a load to the generator during programmed exercise periods.
1. Provide contactors and controls that switch the output of the generator to the load bank during exercise periods. In the event that a power outage occurs during an exercise period, the controls will automatically transfer the generator output from the load bank to the generator distribution panel.
  2. Load removal controls for the Load Bank shall be a fail safe design.
- F. Generator Control and Instrument Panel
1. Provide an illuminated, generator control and instrument panel of solid-state or microprocessor-based design housed in a NEMA 12 enclosure and mounted on the engine-generator set base containing, but not limited to, the following:
    - a. Oil pressure gauge with low pressure cut-off switch
    - b. Water temperature gauge with high temperature cut-off switch
    - c. Emergency stop button
    - d. Frequency meter and running time meter
    - e. Overspeed and overcrank switches
    - f. Ammeter and voltmeter and phase switches for the generator
    - g. Governor and voltage controls
    - h. Manual ON and OFF switch
    - i. Generator Exerciser: Timer to schedule automatic exercising of the engine generator on the integral load bank, per the manufacturer's recommendation
    - j. Common alarm contact to signal failure of unit

- k. Alarm panel with six LED type alarm lights or digital readout with fault code program and output contacts, as follows:
    - (1) High water temperature
    - (2) Engine over crank
    - (3) Low lube oil pressure
    - (4) Engine overspeed
    - (5) Selector switch "off"
    - (6) Emergency stop
  - l. Two-wire, remote, start/stop termination
  - m. Oil low-level switch
  - n. Water low-level switch
  - o. Battery charger
  - p. Indicating lights
  - q. "Push to Test" button and circuitry to test all indicating lights
  - r. Output contact for unit operating at rated voltage
2. Provide all safety devices necessary for the protection of the engine generator set that alarm and shut down the set.

All alarm points and output contacts shall report to the facility SCADA F-PLC-01.

- G. DC Engine Starting System: Provide a dc powered, engine-starting system consisting of batteries and battery charger operating at 28-volt dc.
- 1. Batteries: Provide a set of lead-acid storage batteries of the heavy-duty, diesel starting type having the required system dc voltage and adequate ampacity for six series of four cranking cycles of 15 seconds "ON" and 10 seconds "OFF" at the worst ambient temperature without recharging. Provide the battery set mounted on a metal battery rack with the necessary cables and clamps.
  - 2. Battery Charger: Provide an automatic-float type battery charger consisting of a silicon controlled rectifier to provide a constant voltage output, with the necessary transformer to operate from a 115-volt, 1-phase, 60 Hertz lighting circuit. Provide a charger having a dc voltmeter, dc ammeter, equalizer timer and control switch, and sufficient ampere rating to maintain the charge on the engine starting battery. Provide a charger with protection against short circuits, overloads and reverse battery connections. Provide a charger capable of fully recharging the completely dead batteries in 8 hours time. During

battery recharge the charger shall be capable of cranking the engine directly – when manually selected.

#### H. Weather Protective Enclosure

1. Provide the engine generator set and all accessories factory installed within a weather protective, corrosion resistant, sound attenuating NEMA 3RX enclosure of 12-gauge steel construction suitable for a marine type environment. Provide the enclosure with at least one access door on each side and one access door in the rear, with provisions for being locked and keyed alike. Enclosure shall be rodent proof.
2. Provide the enclosure with fixed air-intake louvers and an expanded-metal exhaust-air opening. Mount the exhaust silencer on the roof of the enclosure with an exhaust elbow and rain cap. The air exhaust shall discharge so not to constitute a hazard to operating or maintenance personnel walking nearby.
3. Provide internal bracing as required.
4. Provide an enclosure suitable for sound attenuation such that the overall (enclosure, air and exhaust) noise level does not exceed 65 dBa at 23 feet, with the engine generator set operating at full load.
5. Provide interior lighting with a control switch at the door, an outdoor light fixture over the main access door controlled by a photocell and control switch at the door. Also provide duplex ground fault receptacles around the interior of the enclosure.
6. Provide thermostatically controlled unit heaters and exhaust fans to keep the temperature of devices in the generator enclosure to within the manufacturers published permissible temperature limits when the generator is not running.
7. Provide sufficient space for all fixed piping, valves, and fittings between the sub-base fuel storage tank, the engine generator set and the supply and accessory connections external to the enclosure.
8. The enclosure shall provide space for all transitions needed to accommodate connections to the fuel fill line, vents, recirculation lines and electrical raceways.
9. Provide high temperature heat detectors and a manual pull station inside the enclosure. Wire these devices to the Fire Alarm Control Panel and SCADA system in the main building, where they may be monitored.
10. Provide a ground reference bus for the engine generator, the enclosure and all equipment located within the enclosure.



11. Enclosure shall provide space for the battery rack, batteries, battery charger, power distribution panels, transformer and Electrical Monitoring and Control Panel to be mounted inside the structure and not on the engine or its supporting structure. This is intended to reduce vibration and heat effects on these items.

I. Dual Wall Sub base Fuel Storage Tank

1. Provide a dual wall sub base tank constructed of 8 gauge aluminized steel on top and 12 gauge aluminized steel on sides and bottom. Provide with manual overfill protection, internally baffled to prevent immediate resupply of heated return fuel, lockable 2-inch fill cap, fuel level gauge, tank to foundation ground clearance for visual secondary leak detection, load bearing vertical "C" channel at generator set mounting points, vertically accessible primary vent, venting in both primary and secondary containments, weatherproof secondary containment, low and high fuel level and leak detection alarms.
2. Provide a storage tank with a minimum capacity of 1500 gallons or 24 hours of fuel whichever is greater.
3. Provide a storage tank constructed in accordance with and listed to UL 142.
4. Provide the tank with all required fittings and with all pipe connections required for enclosure and external fuel piping and fueling related devices. All shall be made up at the manufacturer's facility or in the field as directed by the manufacturer.
5. Coordinate fittings and connections with the external fuel and vent piping supplier that runs lines from the fuel port.

J. FUEL RECIRCULATING SYSTEM – 11 GPM

1. A UL 508 listed fuel purification system shall be furnished to automatically circulate and clean fuel in a 1500 gallon sub-base above ground storage tank on a pre-programmed basis without the use of replaceable filter elements. The system shall be centrifugal based and capable of removing a minimum of 99.5 percent of all water, including emulsified water and 98 percent of the solid or particulate contaminants found in fuel to approximately 10 microns. The system shall be PLC based with an Operator Interface Touch Screen Panel mounted on the front door that allows for programming and alarm monitoring. The fuel purifier, Touch Screen Interface and PLC controller shall be heated to allow for operation in cold climates. In addition, an audible alarm, alarm acknowledge switch and a system HOA switch shall be mounted on the front door for easy operator use. Internal relays shall be available for providing system alarm status. The system shall include a continuous duty motor and fuel pump, operating from 208 VAC power, capable of pumping fuel at not less than 11 gallons per minute with a 1 hp motor. All system components

shall be housed in a NEMA 4X rated weather proof, key locked cabinet. The inlet and outlet openings in the cabinet shall allow for the termination of the secondary containment pipe within the cabinet. A weatherproof, duplex 120 VAC electrical outlet shall be provided in the interior of the cabinet. A full system operations test shall be conducted at the factory before shipment to verify the system is working within parameters and has no leaks in the plumbing. Factory personnel shall provide on-site start-up and operator training.

2. The factory packaged purification system shall consist of the following:
  - a. NEMA 4X Weatherproof enclosure:
    - (1) 14-gauge steel construction with welded seams and flanged door opening
    - (2) Suitable for pad or wall mounting
    - (3) Two hinged front doors
    - (4) Gasketed Operator Interface Touch Screen in front door
    - (5) Containment basin in bottom with Manual drain plug
    - (6) Key Lockable Handle
    - (7) 1-inch NPT right side inlet with shutoff ball valve, 1 inch, bronze with stainless steel ball and Teflon seal
    - (8) 1-inch NPT left side outlet with shutoff ball valve, 1 inch, bronze with stainless steel ball and Teflon seal
    - (9) Finished in white powder marine finish coating
    - (10) 3" dia openings around the inlet and outlet pipe to allow for termination of secondary containment pipe within the enclosure
    - (11) Pump
      - (a) Positive displacement gear pump
        - 1) Aluminum housing
        - 2) Steel gears
        - 3) Hardened steel shaft
        - 4) Mechanical shaft seal
        - 5) Pressure relief valve
        - 6) Priming Tee

- (b) 11 GPM at 100 psi capacity at 1800 rpm

(12) Motor

- (a) 1 HP
  - 1) 208, 1-phase, 60 Hz
  - 2) Open drip proof construction
  - 3) Integral overload protection
- (b) Flexible, self-aligning shaft coupler.

(13) Controls

- (a) Operating Range of 32 F to 122 F
- (b) PLC Based
- (c) Touch Screen Operator Interface
  - 1) Back lit
  - 2) Day Light Readable
- (d) Security Code Activated

(14) Fuel Purifier

- (a) RCI FP 1000
- (b) Flow Rate – 40 GPM
- (c) High Water Sensor
- (d) Water Drain Valve – Manual 1” Brass
- (e) Water Removal - 99.5%
- (f) Particulate Removal – 98% to 10 Microns

(15) Heaters

- (a) Purifier
- (b) PLC Controller
- (c) Touch Screen Interface

(16) System Alarms

- (a) Fuel Leak in Basin
- (b) High Water
- (c) High Pressure
- (d) Pump Fail

## (17) Interface to other devices:

## (a) 5 - Dry Contact relays, rated at 12 AMPS

- 1) 4 - Individual system alarms listed.
- 2) 1 - Alarm Summary

## (18) Audible Alarm – installed on outside of front door

## (19) Alarm Acknowledge Switch - installed on outside of front door

## (20) HOA Switch - installed on outside of front door

## (21) Pump and purifier installed with unions

## (22) Control Devices

## (a) Pump Motor Starter

- 1) 20A single pole circuit breaker
- 2) 30A DP contactor
- 3) Pump control switch
  - a) Auto, Off, Manual
  - b) Weatherproof, key operated
  - c) Control power fuses
  - d) Connection terminal blocks

3. The system shall not require the replacement or periodic cleaning of any type filter element or screens. The system shall include a magnetic fuel decontamination unit designed to help prevent the build up of microbiological contamination.
4. Factory authorized personnel shall provide start-up and operating training services.
5. Basis of design is "RCI Technologies" model FRS-660-11 UL - Automatic Recirculation System. Equivalent products of other manufacturers may be submitted for approval.

## K. Fuel Piping

1. Provide Zinc free piping and fittings for all fuel piping in accordance with the equipment manufacturer's recommendations.

2. Piping external to the sub-base engine generator and the fuel recirculation system enclosures shall be double walled containment type as specified in Section 15191 - Diesel Fuel Piping
3. Provide foot valve in the suction line pipe connecting the sub-base fuel tank to the Fuel Quality Maintenance System.
4. Provide a check valve, inside the engine-generator enclosure, in the fuel supply line to the sub-base fuel tank.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install the engine generator set, fuel storage tank, radiator and fuel recirculation system on concrete mounting pads or structures as shown; in accordance with manufacturer's instructions. Provide all required piping between generator set and remote mounted devices (radiator and fuel recirculation).
- B. Grounding and Power Connections: Install local ground for all equipment enclosures and fuel tanks. Make and test all electrical power, ground and control connections
- C. Fuel: Make and test all fuel pipeline connections. Fill storage and day tank with fuel, bleed fuel pipelines to remove air and prime fuel pumps as per manufacturer's instructions.
- D. Slope fuel piping between the sub base storage tank and the fuel recirculation system toward the recirculation cabinet.
- E. After all tests and acceptance of the Unit fill the fuel storage tank with the fuel type specified by the City of New York.
- F. Connect all level and alarm devices for remote monitoring to an interface terminal in the enclosure for extension to the main MTS building.

#### 3.02 FIELD QUALITY CONTROL

- A. Initial Test Run: Test start and run the engine generator set at no load for at least 30 minutes to check dc starting system, vibration free installation, fuel line leaks, all gauges and meters, engine rpm, generator voltage and to warm up the engine generator for the load test, as per the manufacturer's instructions.
- B. Inspections: Inspect all engine generator systems after initial test run for defects and rectify in accordance with manufacturer's instructions.
- C. Tests: Carry out a field test of the engine generator system for 4 hours at full load in the presence of the Resident Engineer. Furnish dry type load banks for the load

test and provide precise incremental loading on engine generator until it reaches full load. Check phase voltages, current frequency, vibration, and temperatures as per manufacturer's instructions.

### 3.03 OPERATION DEMONSTRATION

- A. **Manufacturer's Service Representative:** Furnish the services of the engine generator manufacturer's representative to assist in installation, start-up, field testing, calibration, placing into operation and provide training as specified in Section 01821 – Training, including the acceptance test run of the set. Have the representative carry out a thorough inspection of the installation; certify that the installation is correct and complete in accordance with the manufacturer's instructions; to confirm that the set is ready for acceptance test run; and to instruct operating personnel in the operation and maintenance of the set.
- B. **Final Acceptance Test (Demonstration) Run:** Have the manufacturer's service representative perform the final acceptance test run of the engine generator set in the presence of the Resident Engineer. Perform the final acceptance test run by simulating a power failure and observing automatic engine generator startup, acceleration to speed and assumption of available load at the site without any problems and as per claimed performance. Demonstrate the compatibility of the engine generator with the adjustable frequency drives and solid-state starters used for motors; and its capability to start and operate the loads in the desired sequence. Also demonstrate that the engine generator is capable of starting and sustaining the load with a voltage drop of not more than 20 percent of the rated value. Simulate and demonstrate that the alarm and shut down features operate satisfactorily.
- C. **Training:** Following completion of installation and field testing furnish training for 12 employees of the City in the proper operation, trouble-shooting and maintenance of the equipment as described in Section 01821 – Training.
  - 1. **Operational Training:** A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  - 2. **Maintenance Training:** A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
- D. **Provide the services of the Fuel Quality Maintenance System, the Load Bank and the Enclosure Manufacturers to provide support for the installation, start-up and testing of the equipment furnished by them. They shall certify that the equipment and installation meet their requirements for this installation.**

### 3.04 PAINTING

- A. **Shop Painting:** Paint the generator systems as specified in Section 09912 - Interior Painting.

- B. Field Painting: Touch up scratched and marred surfaces to match with original finishes.

3.05 IDENTIFICATIONS

- A. General: Provide identifications meeting the requirements of Section 16075 – Electrical Identification.
- B. Component Identification: Identify all system components, cables and wires by applicable labels indicating unit numbers, circuit numbers.

-END OF SECTION-

**Section 16264**  
**UNINTERRUPTIBLE POWER SUPPLY SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Section Includes: Requirements for providing and testing uninterruptible power supply (UPS) systems.
1. Three-Phase Systems: Three-phase uninterruptible power supply (UPS) systems consist of rectifier/battery charger, solid-state inverter, static transfer switch, manual bypass switch, batteries with associated controls, ac and dc protection, instrumentation and alarms; housed in suitable metal enclosures.
  2. Single-Phase Systems: Single-phase uninterruptible power supply (UPS) systems consist of rectifier/battery charger, solid-state inverter, batteries with associated controls, ac protection and alarms; housed in suitable metal enclosures.
- B. Related Work Specified in Other Sections:
1. Section 16050 - Basic Electrical Materials and Methods
  2. Section 16060 - Grounding
  3. Section 16075 - Electrical Identification
  4. Section 16121 - Wires and Cables - 600 Volts and Below
  5. Section 16130 - Electrical Raceway Systems
  6. Section 16511 - Lighting
  7. Section 16745 Telephone/Data System.
  8. Section 16751 Access Control System.
  9. Section 16752 Digital Video System.

**1.02 REFERENCES**

- A. Codes and Standards: The following codes and standards are referred to in this Section as follows:
1. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
  2. NFPA 70 - National Electrical Code
  3. NYCBC - New York City Building Codes
  4. NFPA 75 - Standard for the Protection of Electronic Computer/Data Processing Equipment



5. UL 1778 - Uninterruptible Power Systems
6. UL 924 - Emergency Lighting and Power Equipment
7. IEEE C-62.41 IEEE Guide on the Surge Environment in Low Voltage (1000 V and less) AC Power Circuits

### 1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, in accordance with the requirements contained in Division 1.
- B. Product Data and Information: Furnish manufacturers data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities, finishes for all the system components and other relevant data.
- C. Contractors Shop Drawings: Furnish contractors shop drawings for the shop assembled equipment, including the following:
  1. Layout drawings of the assembly showing accurately scaled basic equipment sections, auxiliary compartments, combination sections and location of various system components and their interconnection. Show special relationships of assemblies to associated equipment, including plan and front views of the equipment and layout dimensions. Provide a bill of materials.
  2. Wiring diagrams for assemblies showing connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions.
  3. Furnish construction drawings for equipment requiring field assembly. Clearly differentiate between shop-assembled portions and field assembled portions.
  4. A schematic control diagram for the entire system showing connections to other related systems.
  5. Manufacturer's installation, testing and commissioning instruction for the entire system.
- D. Quality Control: Furnish manufacturers test reports and certified performance records of all equipment installed. Furnish field test reports after equipment is installed.
- E. Operations and Maintenance Manuals: Furnish Operations and Maintenance Manuals of all equipment and assemblies in accordance with Division 1.

**1.04 QUALITY ASSURANCE**

- A. Codes: Comply with local codes and all other applicable codes.
- B. Regulatory Requirements: Comply with applicable Regulatory Agency requirements.
- C. Manufacturer Qualifications: Manufacturer must maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs within 24 hours maximum response time.
- D. Source Limitations: Obtain the UPS and associated components specified in this Section from a single manufacturer with responsibility for the assembly.
- E. Electrical Components, Devices, and Accessories: Listed and labeled.
- F. UL Compliance: Listed and labeled under UL 1778.
- G. NFPA Compliance: Mark UPS components as suitable for installation in computer rooms according to NFPA 75.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. General: Deliver, store and handle all products and materials in accordance with the requirements contained in Division 1.

**1.06 WARRANTY**

- A. General: Provide warranty for all equipment and services furnished as described in Division 1 of these Specifications.
- B. Provide two years from date of substantial completion

**1.07 SPARE PARTS**

- A. General: Provide the following spare parts:
  - 1. One set of each type of fuses.
  - 2. Two batteries of each type and rating.
- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers: Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for approval for review.

1. Three-Phase UPS System.
  - a. MGE Galaxy UPS Systems Inc.
  - b. Chloride Power Systems
  - c. Liebert.
  - d. McPhilben MST
2. Single-phase UPS system including batteries.
  - a. MGE UPS Systems Inc.
  - b. American Power Conversion Corp.
3. Batteries for three-phase UPS systems
  - a. C & D
  - b. Alcad
  - c. Enersys

### 2.02 THREE-PHASE UPS SYSTEMS

- A. Operating Parameters: Provide UPS systems having the following operating parameters:
1. Nominal Power Rating: As indicated on plans or required.
  2. Input Voltage: 208 or 480 Volts, 3-phase, 3-wire – derived system with ground. Adjustable  $\pm 3\%$ .
  3. Input Power Factor: 95 percent minimum
  4. Input Harmonic Filter: Provide a filter to limit the current harmonic distortion to 10 percent.
  5. Output Voltage: 208Y/120V, 3-phase, 4-wire, adjustable  $\pm 3$  percent
  6. Output Frequency: 60 Hz  $\pm 2$  percent
  7. Overload Capability: 110 percent for 10 minutes

8. Operate under the following ambient conditions:
    - a. Ambient Temperature: 0 to 30 degrees C (+32 to +86 degrees F)
    - b. Humidity: 0 to 95 percent non-condensing
  9. Acoustical Noise: less than 65-decibels, A-weighted at 3 feet
  10. Minimum Battery Backup Time: 90 minutes at full load
  11. Install batteries in a matching cabinet.
- B. Description of Operation: Design three-phase UPS systems to operate as follows:
1. Normal Operation: Power the load continuously from the inverter. Derive the power for the rectifier/battery charger from the ac incoming line to provide dc power to the inverter while simultaneously float charging the battery.
  2. Emergency: Upon loss of the ac input power, continue to power the load from the inverter without interruption or switching while the battery provides dc power to the inverter.
  3. Battery Recharge: Upon restoration of the ac power, power the load continuously from the inverter while the rectifier/battery charger provides dc power to the inverter while simultaneously recharging the battery.
  4. Bypass Mode: Upon failure of the UPS system, transfer the load from the inverter to the ac line using a static-bypass transfer switch.
  5. Maintenance Bypass/Test Mode: Provide a manual make-before-break maintenance bypass switch to isolate the UPS for maintenance and testing.
- C. Rectifier/Battery Charger: Provide rectifier/chargers to convert the input AC power to a regulated dc voltage with the following features:
1. Solid state rectifier/charger of a modular design to facilitate maintenance.
  2. Size the rectifier/charger to serve full load of the inverter and fully recharge the battery within 10 times the rated run time at full load.
  3. Provide fuses to protect the rectifier/charger.
  4. Provide input transformers when required to obtain proper voltage outputs or control harmonics.
- D. Batteries: Use sealed, maintenance-free, high-discharge rate batteries consisting of lead acid cells. Size batteries for the specified backup time having a minimum end voltage of 1.67 volts per cell.

- E. Inverter: Provide inverters having the following features:
  - 1. Pulse width modulated (PWM) type capable of providing the output power characteristics specified.
  - 2. Design the inverter of modular assemblies to facilitate maintenance.
- F. Static-Bypass Transfer Switches: Provide solid-state transfer switches rated for continuous duty with the following operational features:
  - 1. Uninterrupted Transfer: Transfer the load to the bypass source without interruption upon sensing any of the following fault conditions:
    - a. Inverter overload
    - b. Inverter failure
    - c. Battery low voltage
  - 2. Interrupted Transfer: Transfer the load to the bypass source with an interruption not exceeding 0.2 seconds during a fault condition when any of the following occur:
    - a. Bypass voltage exceeds  $\pm 10$  percent of the UPS rated output voltage.
    - b. Bypass frequency exceeds  $\pm 2$  hertz from the UPS rated output frequency.
  - 3. Forward Transfer: Transfer the load from bypass source to the UPS automatically without an interruption when the UPS is operating within its ratings.
- G. Internal Bypass Switches: Provide internal bypass switches for maintenance of the system.
- H. Enclosures: Provide ventilated, free-standing enclosures for the electronic components of the UPS system. Provide separate free-standing battery enclosures.
- I. Controls, Indicators and Alarms
  - 1. Provide each UPS system with a visual display panel indicating the following parameters:
    - a. UPS On-line
    - b. UPS On Battery
    - c. UPS Off-line
    - d. UPS Fault
    - e. Input voltage
    - f. Bypass voltage
    - g. Bypass input frequency

- h. UPS Output voltage
    - i. UPS Output frequency
    - j. UPS Output current
    - k. UPS Output kVA
    - l. dc Voltage
    - m. Available battery capacity
  - 2. Provide each UPS system with the following dry contacts rated 10-amperes at 120V ac:
    - a. UPS On-line
    - b. UPS On Battery
    - c. Load On Bypass
    - d. UPS Fault
  - 3. Provide each UPS system having the following controls and protection:
    - a. ac circuit breaker
    - b. Inverter "ON/OFF" switch
    - c. Manual bypass switch
    - d. Float/equalize switch
    - e. Transfer test switch
    - f. Emergency Power Off switch
- J. Identification: Provide identification meeting the requirements of Section 16075.
- 2.03 SINGLE-PHASE UPS SYSTEMS
- A. Operating Parameters: Provide on-line UPS systems, UL Inc. Listed.
  - B. Emergency Lighting UPS shall have the following operating parameters:
    - 1. Nominal Power Rating: As indicated on plan or required.
    - 2. Electrical Power input: 277 volt, 1-phase, 60-hertz as indicated on plan or required
    - 3. Electrical Power output: 277 volt as indicated on plan or required, 1-phase, 60-hertz (adjustable  $\pm 5\%$ )
    - 4. Surge Protection: 240 joules
    - 5. Voltage Regulation: Automatic
    - 6. Batteries: Maintenance-free sealed lead-acid
    - 7. Acoustical Noise: Less than 40dB at 3 feet

8. User Displays:
    - a. On ac Power
    - b. On Battery
    - c. Replace Battery
    - d. Overload
    - e. Load and Battery bar-graphs
  9. Recharge time (maximum): 4 hours
  10. Temperature: 0 degrees C to +35 degrees C (+32 degrees F to +95 degrees F)
  11. Minimum Battery Backup Time:
    - a. 90 minutes for Emergency Lighting at Full Load
  12. The UPS for the Emergency Lighting System shall have the characteristics in 2.02 B through J of the Three Phase UPS above.
- C. Other single phase UPS shall have the following operating parameters:
1. Nominal Power Rating: As indicated on plan or required.
  2. Electrical Power input: 120-volt, 1-phase, 60-hertz as indicated on plan or required
  3. Electrical Power output: 120-volt as indicated on plan or required, 1-phase, 60-hertz (adjustable  $\pm 5\%$ )
  4. Surge Protection: 240 joules
  5. Voltage Regulation: Automatic
  6. Batteries: Maintenance-free sealed lead-acid
  7. Acoustical Noise: Less than 40dB at 3 feet
  8. User Displays
    - a. On ac Power
    - b. On Battery
    - c. Replace Battery
    - d. Overload
    - e. Load and Battery bar-graphs
  9. Recharge time (maximum): 4 hours

10. Temperature: 0 degrees C to +35 degrees C (+32 degrees F to +95 degrees F)

11. Minimum Battery Backup Time

a. 120 minutes

D. Identification: Provide identification meeting the requirements of Section 16075.

E. Enclosures: Single phase units (except Emergency Lighting Unit) suitable for standard 19 inch equipment racks. Three phase units suitable for floor or wall mounting. Batteries support and ventilation as required.

F. Minimum overload capacity shall be 110% for 30 seconds short circuit protected.

G. Full system self-diagnostics test on power up.

H. Voltage regulation to provided pure sine wave output on battery operation with +/- 5% RMS voltage regulation.

## 2.04 SOURCE QUALITY CONTROL

A. General: Provide complete Uninterruptible Power Supply (UPS) systems designed, assembled, wired and tested at the point of manufacture in accordance with the latest NEC (NFPA), NEMA, UL, IEEE and ANSI standards.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. General: Install all equipment as indicated, in accordance with manufacturer's written instructions and comply with requirements of NEMA Standards, NEC, NYCBC, project-applicable portions of NECA's Standard of Installation and applicable ANSI Publications.

B. Coordination: Coordinate with other work including cabling and wiring work as necessary to interface installation of shop assembled equipment with other work.

C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.

D. Grounding Connections: Make equipment grounding connections for the shop assembled equipment as indicated on the Drawings. Tighten connections in accordance with UL Standard 486A to assure permanent and effective grounding.

E. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.



## 3.02 FIELD QUALITY CONTROL

- A. General: Perform field inspection and testing for each UPS system to demonstrate that each unit meets the following:
1. Has not been damaged during transportation and installation.
  2. Has been properly installed.
  3. Has no mechanical defects.
  4. Has been properly connected.
- B. Tests: Perform field tests as follows:
1. Inspect and test the installation with respect to the safety requirements of NEC pertaining to grounding and insulation resistance.
  2. Demonstrate proper operation of each UPS system by simulating conditions.
  3. Repair or replace defective materials at no cost to the Owner
- C. Manufacturer's Field Services: Provide the services of a qualified representative of each manufacturer of the Uninterruptible Power Supply (UPS) systems to inspect the installation of equipment make any necessary adjustments and instruct the operating personnel about operation, maintenance and provide training as specified in Section 01821.
1. Provide a service engineer when the equipment is placed into operation.
  2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.
  3. Following completion of installation and field testing provide training for 12 employees of the City of New York in the proper operation, troubleshooting and maintenance of the equipment as outlined below. Provide training at the City of New York's facilities at a time agreeable to the City of New York:
    - a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
    - b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

-END OF SECTION-

**Section 16266**  
**ADJUSTABLE FREQUENCY DRIVES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for providing, installing and testing the 480-volt adjustable frequency drives. Provide drives in individual free standing enclosures, wall mounted enclosures, or incorporated into motor control centers, as shown. Furnish harmonic studies as specified.

**1.02 RELATED SPECIFICATIONS**

1. Section 01821 – Training
2. Section 09912 - Interior Painting
3. Section 15900 – HVAC Controls
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16055 – Electrical Requirements for Shop Assembled Equipment
6. Section 16075 - Electrical Identification
7. Section 16491 - Control Components and Devices

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NEMA ICS 1 - General Standards for Industrial Control and Systems
2. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies
4. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives
5. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems
6. NEMA 250 - Enclosures for Electrical Equipment
7. NFPA 70 - National Electrical Code
8. IEEE 85 - Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery

- 9. IEEE 519 - IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- 10. UL 845 - Motor Control Centers

#### 1.04 SYSTEM DESCRIPTION

##### A. Design Requirements

- 1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.
- 2. Provide adjustable frequency drives that fit in the space shown. Units exceeding the dimensions shown will not be acceptable.
- 3. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored. Restart shall be subject to an adjustable time delay and a selectable power level of operation.

B. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor's full nameplate rating.

C. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.

D. 6-Pulse Drive Technology: Provide adjustable frequency drives serving motors 75 HP or smaller that utilize 6-pulse drive technology.

E. 18-Pulse Drive Technology: Provide adjustable frequency drives serving motors 100 HP or larger that utilize 18-pulse drive technology.

F. Performance Requirements: Provide adjustable frequency drives to meet the following requirements of IEEE 519:

- 1. Total harmonic distortion THD (Voltage): Maximum of five percent for general distribution systems as measured at the point of common coupling.
- 2. Total current harmonic distortion: Not to exceed the values in Table 10.3, Current Distortion Limits for General Distribution Systems (120 V through 69000 V) of IEEE-519 at the point of common coupling.
- 3. Capacitor traps for controlling harmonics that require tuning to the power system are not acceptable.
- 4. Operate at a minimum efficiency of 95 percent at rated load.

5. Operate from a 480-volt, 3-phase, 60-hertz supply with a voltage variation of plus 10-percent or minus 20-percent and a frequency variation of plus or minus 2-hertz.
6. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.
7. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.
8. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.
9. Operate under the following ambient conditions:
  - a. Ambient Temperature: 0 to 40 degrees C
  - b. Humidity: 0 to 95 percent

#### 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish catalog data including rating and descriptive literature of all components and systems.
- C. Shop Drawings: Furnish the following shop drawings customized for the project:
  1. Bill of materials including manufacturers name and catalog number
  2. Outline drawings showing dimensions, arrangement, elevations, identification of components and nameplate schedule for all units
  3. Interconnection wiring diagrams
  4. Individual schematic control diagrams for each unit
  5. One line diagrams
  6. Obtain and enter full performance data for all motors shown
  7. Certification that the adjustable frequency drives are compatible with the motors and the equipment loads to be driven

- D. System harmonic distortion study: Furnish a system harmonic distortion study as follows:
1. Obtain data on utility services, plant loads and plant operation. Verify electrical service rating including transformer size, short circuit capacity and X/R ratio.
  2. Prepare a harmonic distortion study of plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.
  3. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.
  4. Point of Common Coupling: The point of common coupling is the motor control center or switchgear directly upstream of the adjustable frequency drive.
  5. Include analysis of all data with recommendations.
- E. Quality Control: Furnish test reports, certificates of inspection and manufacturer's instructions.
- F. Operations and Maintenance Manuals: Furnish operations and maintenance manuals as specified in Section 01831.

#### 1.06 QUALITY ASSURANCE

- A. Standards: Provide all adjustable frequency drives manufactured in accordance with referenced standards.
- B. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.
- C. Codes: Manufacture and install each adjustable frequency drive in accordance with the NEC and local codes.
- D. Failure to Meet the Harmonic Requirement: Failure to meet the harmonic requirement as determined by field measurement: If the installed adjustable frequency drives fail to meet the harmonic limits specified, modify the adjustable frequency drives as follows:
1. Perform work at no additional cost to the City.
  2. Install additional harmonic reduction equipment until the specified limit is achieved.

3. In the event that harmonic distortion limits cannot be achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Shipping and Packing: Rigidly brace and protect against weather, damage, and undue strain, all structures, equipment and materials.
- C. Storage and Protection: Furnish clean storage facilities for all equipment delivered but not installed. Provide conditioned air for storage facilities in accordance with the equipment manufacturer's recommendations.
- D. Spare Parts: Furnish spare parts at the same time as pertaining equipment. Deliver the spare parts to the City after completion of the work.

#### 1.08 SPARE PARTS

- A. Furnish the following spare parts per each group of similar sized units.
  1. All parts recommended by the manufacturer in published literature as spare parts. As a minimum, provide the following:
    - a. Six of all sizes and types of power and control fuses
    - b. Six LED displays of each color
    - c. Two keypads of each type used
    - d. Two printed circuit boards of each type used
    - e. Four filter capacitors of each size used
    - f. Four diodes of each type used
    - g. Four transistors, gate turn off thyristors IGBT's or SCRs of each type used
    - h. Three 12-ounce spray cans of the final finish for touch-up
- B. Packaging: Package spare parts in containers bearing labels and identify all spare parts for reordering. Deliver spare parts in original factory packages.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
1. Robicon
  2. Cutler-Hammer
  3. Toshiba

## 2.02 DESIGN

- A. Input Disconnect: Provide an input circuit breaker with a minimum interrupting rating of 65,000 rms symmetrical amperes.
- B. Input Reactor: Provide input reactor or isolation transformer, if required, as determined by system harmonic distortion analysis.
- C. Converter Section: Provide input section that converts 480-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes, bridged rectifiers or SCR's.
- D. Filter Sections: Provide dc link reactor and filter capacitors as required.
- E. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output. Maintain a constant volts per hertz ratio on the output with voltage boost for startup as required.
- F. Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:
1. "Local-Remote" control selection
  2. Speed meter with hertz and 0-100 percent scales
  3. Output ammeter
  4. Elapsed time meter
  5. Diagnostics package with fault indication and reset push button
- G. Control Features: Provide a control system for each drive that allows the following functions:
1. Remote, isolated 4-20 ma speed control input
  2. Isolated 4-20 ma speed output
  3. Alarm outputs
  4. ON/OFF status output

H. Internal Control Adjustments: Include the following control adjustments for each drive:

1. Acceleration time, 4 to 60 seconds
2. Deceleration time, 4 to 60 seconds
3. Minimum speed limit
4. Maximum speed limit
5. Inverter current limit
6. Supply undervoltage trip

I. Protection Features: Provide the following drive protection features:

1. Input line current limiting fuses rated 200,000 rms symmetrical amperes short circuit current.
2. Electronic overcurrent protection for instantaneous overload
3. AC input line undervoltage protection, adjustable from 60-100 percent nominal voltage with time delay adjustment and low speed override.
4. Overfrequency protection
5. Phase loss protection
6. DC overvoltage protection
7. Logic supply voltage low level protection
8. Line-to-line and line-to-ground output short circuit protection
9. Line-to-line and line-to-ground surge arresters sized for 480-volt 3-phase grounded wye system
10. Overload capability of 110% of the motor FLA based on the NEC ratings for 60 seconds
11. Control circuit fuses
12. Overtemperature protection
13. Diagnostics module to indicate protection trip conditions

## 2.03 COMPONENTS

- A. General: Provide circuit breakers, fuses, transformers, push buttons, switches, indicating lights, relays and timers as specified in Section 16491 – Control Components and Devices.



- B. Power Solid State Components: Provide power solid state switching components with a one minute current rating greater than 110 percent of rated current for variable torque drives or 150 percent of rated current for constant torque drives.
- C. Control Power Transformer: Furnish a constant voltage control power transformer to maintain control power with supply voltage variations from 70-110 percent nominal.
- D. Printed Circuit Boards: Apply a clear conformal coating of acrylic to all printed circuit boards.

#### 2.04 ENCLOSURES

- A. Provide adjustable frequency drive drives in NEMA 1 filtered and gasketed enclosures with full rear cover plates. Provide other rated enclosures suitable for the environment where the drive is located.

#### 2.05 IDENTIFICATION

- A. General: Provide identification of the adjustable frequency drives and their components as specified in Section 16075 - Electrical Identification.
- B. Nameplates: Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.
- C. Location: Locate nameplates so that they are readily associated with items labeled.
- D. Additional Nameplate: Where nameplates are installed on removable relay or device doors, install an additional nameplate within the relay or device.
- E. Additional Engraving: Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

#### 2.06 WIRING

- A. General: Provide internal wiring with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Use No. 14 AWG wire for control interconnections. Provide power connections as required for the service.
- B. Wire Marker: Provide wire markers at each end of all wires.
- C. Wiring to Door Mounted Devices: Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.
- D. Terminal Blocks: Provide wiring of all control connections to all external connections through individual, positive-latch, pull-apart type control terminal blocks rated 600-volts. Locate terminal blocks for front access.

- E. Terminal for External Connections: Provide sufficient terminals for all devices external to the adjustable frequency drive.

## 2.07 SOURCE QUALITY CONTROL

- A. Shop test each adjustable frequency drive in accordance with IEEE and NEMA standards, including high potential tests and other standard tests for that particular class of equipment. Notify the City fourteen (14) days prior to start of factory testing so that the City, at their option, may witness the testing.
  - 1. After final assembly, test each adjustable frequency drive at full load with application of line-to-line and line-to-ground bolted faults and show that the adjustable frequency drive trips electronically without device failure.
  - 2. After all tests have been performed, burn-in each adjustable frequency drive for 40 hours at 100 percent inductive or motor load.
  - 3. After the burn-in cycle is complete, subject each adjustable frequency drive to a 30 minute cycling motor load test before inspection and shipping.
- B. Operational Tests: After the equipment has been completely assembled, perform operational test to determine operating conditions and circuit continuity. Provide pushbuttons and selector switches to simulate all control input contacts and indicating lights to indicate all control outputs. Provide a 4-20ma signal generator to simulate analog signals.
- C. Test Equipment: Provide all equipment, devices, instrumentation, and personnel required to perform the tests. Upon satisfactory completion of the test, submit two (2) certified copies of the test report to the Engineer. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Protective Adjustments: Set all circuit breakers per the approved short circuit and coordination study.
- C. Operational Adjustments: Set all operational devices for proper system operation.
- D. Cable Connections: Terminate and label all field wiring per approved drawings.

## 3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Tests: Perform the following field tests:
  - 1. Close and open each circuit breaker to test operation
  - 2. When site conditions permit, energize and de-energize each equipment item served by each drive, testing the complete control sequence of each item including acceleration and deceleration over complete operating range.
  - 3. Harmonic Measurement: Perform a harmonic system analysis to demonstrate full compliance with IEEE 519 voltage and current harmonic distortion requirements specified. Accurately measure the amplitude of the harmonic current imposed on the 60 hertz sine wave with a harmonic spectrum analyzer. Provide additional harmonic reduction equipment to meet the specified limits. If the harmonic distortion limits are not achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.
  - 4. Operate each adjustable frequency drive with driven equipment at full load and test for hot spots.
  - 5. Test Reports: Furnish detailed test reports of all tests indicating test performed, discrepancies found, and corrective action taken.
- C. Manufacturer's Field Services Representative: Provide the services of a factory-trained service engineer, specifically trained on the adjustable frequency equipment to assist in installation, start-up, testing, calibration, placing into operation and provide training as specified in Section 01821 – Training.
  - 1. Provide a service engineer when each drive is placed into operation.
  - 2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.
  - 3. Following completion of installation and field testing provide training for 12 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:
    - a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

- b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.03 PAINTING

- A. Shop Painting: Paint the adjustable frequency drive equipment as specified in Section 09912 - Interior Painting.
- B. Field Painting: Touch up scratched and marred surfaces to match with original finishes.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16411**  
**DISCONNECT SWITCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing and installing enclosed fused safety switches for use as feeder and branch circuit switching and disconnect devices for motors and equipment.

**1.02 RELATED SPECIFICATIONS**

- 1. Section 09912 - Interior Painting
- 2. Section 16050 - Basic Electrical Materials and Methods

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code
  - 3. NEMA KS1 - Enclosed Switches
  - 4. UL 198E - Class R Fuses
  - 5. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data indicating disconnect switch ratings and dimensions. Furnish manufacturer's data on fuses including time-current curves.

**1.05 QUALITY ASSURANCE**

- A. Codes: Provide disconnect switches meeting the requirements of NFPA, the NYCBC, National Electrical Code and local codes.

- B. Regulatory Requirements: Provide all disconnect switches designed, manufactured and tested in accordance with latest ANSI, IEEE and NEMA Standards, and UL listed.

#### 1.06 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. Twelve of each size and type fuse installed.
- B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Disconnect Switches
    - a. Square D Company
    - b. Cutler Hammer
    - c. Killark
  - 2. Fuses
    - a. Bussmann
    - b. Littelfuse

#### 2.02 DISCONNECT SWITCHES

- A. General: Provide disconnect switches of the NEMA KS-1, heavy-duty, load-interrupter, enclosed-knife switch type with externally operating handle interlocked to prevent opening of the front cover with the switch in the ON position. Provide an interlock that is defeatable from the front of the switch. Provide handle lockable in the OFF position. Where specified on Contract Drawings or required by code furnish switch with handle lockable in the "on position".
- B. Disconnect Switch Ratings: Provide disconnect switches rated for 600-volts as applicable and horsepower rated when used in motor circuits. Current ratings are as indicated. Provide short circuit withstand ratings as required in areas where high level  $I_{sc}$  are available.
- C. Service Entrance: Where shown, provide disconnect switches suitable for service entrance.

- D. Fusible Switches: Furnish switches with rejection feature to allow only Class R fuses to be installed.
- E. Disconnect Switch Housings: Provide disconnect switches housed in NEMA rated enclosures as follows:

AREA	ENCLOSURE
Outdoor and below grade elevation indoors	NEMA 4 – Watertight
Corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown	NEMA 4X - Watertight and corrosion-resistant stainless steel with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures
Above grade indoor	NEMA 12 – Industrial

## 2.03 FUSES

- A. Characteristics: Provide UL 198E listed Class RK1 dual element, time-delay fuse with an interrupting rating of 200,000 rms symmetrical amperes.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install disconnect switches as shown or required. Comply with requirements of the NYCBC, NEC and local electrical codes.
- B. Coordination: Coordinate with other work including cabling and wiring work.
- C. Torque Requirements: Tighten electrical connectors and terminal including screws and bolts, in accordance with equipment manufacturers', published torque tightening recommendations. Where manufacturers' torque requirements are not available, tighten connectors and terminals in accordance with UL Standard 486A.
- D. Fuse: In each disconnect switch install the proper type and size fuse for the load served.
- E. Labels: Provide adhesive label on inside of door of each fusible disconnect switch indicating type and size of fuse for replacement.

### 3.02 PAINTING

- A. Paint the disconnect switches as specified in Section 09912 - Interior Painting.

-END OF SECTION-



NO TEXT FOR THIS PAGE

**Section 16415**  
**AUTOMATIC TRANSFER SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for providing automatic transfer switches including control modules to provide completely automatic operation.

**1.02 RELATED SPECIFICATIONS**

1. Section 09912 - Interior Painting
2. Section 13851 - Fire Alarm and Detection System
3. Section 13921 - Electric Drive Centrifugal Fire Pumps.
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16085 - Short Circuit and Coordination Study

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NFPA 70 - National Electrical Code (NEC)
2. NFPA 20 - Installation of Stationary Pumps for Fire Protection
3. NFPA 110 - Emergency and Standby Power Systems
4. NYCBC - New York City Building Code
5. NEMA ICS 10 - AC Automatic Transfer Switches
6. UL 486A - Wire Connectors and Soldering Lugs For Use With Copper Conductors
7. UL 1008 - Standard for Automatic Transfer Switches

**1.04 SYSTEM DESCRIPTION**

- A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent non-condensing.
1. Arrange the equipment for convenient and ready accessibility from the front, for inspection and maintenance of all devices, terminals and wiring.

## 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data for all associated equipment and devices indicating dimensions, size, voltage ratings, current ratings, withstand and interrupting ratings.
- C. Shop Drawings: Furnish shop drawings for automatic transfer switches to include the following:
  - 1. Outline drawings showing arrangement, elevations and identification of components
  - 2. Bill of materials including manufacturers' name and catalog number
  - 3. Interconnecting wiring diagrams, where required
  - 4. Individual schematic and wiring diagrams
- D. Quality Control: Furnish the following test reports and certificates as specified in Division 1:
  - 1. Certified Shop Test Reports for the automatic transfer switch and related components
- E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals as specified in Section 01831.
- F. Prepare a recommended plan for the Commissioners review, to include recommendations for setting the "time delay to transfer and retransfer load" considering the interactions of the Utility sources, Switchgear automatic transfers, the Engine-Generator and other ATS in series.

## 1.06 QUALITY ASSURANCE

- A. Codes: Manufacture all automatic transfer switches in accordance with NEMA ICS10, and UL 1008.
  - 1. Manufacture and install each automatic transfer switch in accordance with the applicable portions of the NYCBC, NFPA 70, 110 and local codes.
  - 2. Automatic Transfer Switches that supply service to the fire pump controller shall comply with applicable portions of NFPA 20 and be approved and rated for that service.

3. Automatic Transfer Switches that supply the Building Wire Alarm Systems (Fire Alarm, Purge Panel and Gas Monitoring Panel) shall comply with the requirements of the NYCBC section 4000 and the rules and regulations of the NYCFD
4. Automatic Transfer Switches that are directly connected to the incoming Utility service shall be designed and rated for service entrance connection and shall comply with the direct connection requirements of Article 695 of the NYCEC

B. UL Label: Provide a UL Label on each automatic transfer switch.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 1.
- B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.
- C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

#### 1.08 SPARE PARTS

- A. Furnish the following spare parts:
  1. Two complete replacements of all indicating lamps and fuses used in the installation
  2. Two of each special tool required for maintenance
  3. Three 12-ounce spray cans of the final finish
- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  1. ASCO Controls 7000

2. General Electric Zenith ZTS
3. Russelectric RMT

## 2.02 AUTOMATIC TRANSFER SWITCHES

- A. Description: Provide enclosed, double-throw automatic transfer switches with single solenoid operating mechanism.
- B. Configuration: Electrically-operated, mechanically held with required relays, timers, controls, and contacts.
- C. Provide a solid equipment ground bar in all switches.

## 2.03 RATINGS

- A. Voltage: 480V
- B. Switched Poles: 3
- C. Amperage: As shown on plans.
- D. Loads: Combination tungsten, ballast, resistance, and inductive loads
- E. Withstand and Closing Ratings: 100,000 minimum rms symmetrical amperes at 480V, when used with molded-case circuit breaker. As required to meet the levels indicated for the specific application as found from the Short Circuit and Coordination Study.
- F. Thermal capacity: 20 times continuous ampere rating at 60 cycles.

## 2.04 COMPONENTS

- A. Phase Sequence: A-B-C, left to right, front to back, top to bottom.
- B. Contacts: Provide silver surfaced main contacts protected by a separate renewable arcing contact. Mechanically lock normal and emergency contacts by the operating linkage when in the open or closed position. Provide an operating linkage that will not permit a neutral position when a failure of any coil or disarrangement of any part occurs.
- C. Operating Mechanism: Isolate the mechanical driving system and mechanical interlocks to be electrically dead. Do not use molded plastic parts for the operating linkage between the electrical operator and the main operating shaft of the switch.
- D. Main Bearings: Radial, ball-bearing type
- E. Sensing and Control Relays: Continuous-duty, industrial type with wiping contacts rated 10 amperes minimum.

- F. Control Logic: Solid-state, microprocessor-based. Provide generator exercise accessories for switches with the Standby generator connected as a source. Printed circuit boards shall be conformal coated to resist degradation in the facility environment.
- G. Arc Barriers: Provide arc barriers and arc suppression for each pole.
- H. Terminations: Provide copper compression lugs for termination of large AWG conductors. Tin plated aluminum body lugs will not be acceptable for that application.
- I. Power to operate the switch, controls, indications alarms and microprocessor shall be taken from the power sources that supply the switch.

## 2.05 ACCESSORIES

- A. Indicating Lights: Provide 30.5 mm, LED type indicating lights mounted in the cover of the enclosure to indicate the following:
  - 1. Normal source available
  - 2. Standby source available
  - 3. Load connection to normal source
  - 4. Load connection to standby source
- B. Test Switch: Mount in the cover of the enclosure to simulate failure of normal source.
- C. Preferred Source Selector Switch: Mount in the cover of the enclosure to select the preferred power source.
- D. Transfer Switch Auxiliary Contacts: Provide the following auxiliary contacts rated for 10 amperes at 120 volts.
  - 1. Normal power position: 2 sets N.O., 2 sets N.C.
  - 2. Standby power position: 2 sets N.O., 2 sets N.C.
  - 3. Normal power failure monitor: 2 sets N.O., 2 sets N.C.
- E. Normal Source Monitor: Monitor voltage and frequency on each phase of the normal source. Device shall use "true RMS" sensing.
- F. Standby Source Monitor: Monitor voltage and frequency on each phase of the standby source. Device shall use "true RMS" sensing.
- G. Adjustable Time Delay Transfer Logic: Provide adjustable, solid-state, time delays for the following functions:
  - 1. Normal to standby: 0-5 minutes

2. Standby to normal: 0-30 minutes (ATS-01 and ATS-03)
3. Standby to normal: 0-120 minutes (ATS-02)

- H. Provide additional accessories as required for specific applications like an automatic transfer switch that feeds a service to the fire pump controller transfer switch or generator start contacts for switches that feed emergency or Switchgear B bus system .
- I. Provide nameplates for each switch source and load and a mimic bus to show connections

## 2.06 ENCLOSURE

- A. Enclosure: NEMA Type 12 - Industrial
- B. Accessibility: Provide an enclosure with all current carrying contacts and parts readily accessible from the front for maintenance and inspection without removal of the switch panel, disconnecting of the operating linkage, or disconnecting of power conductors.
- C. Provide watertight "Meyers" hubs for conduit entries to ATS-2 located in the fire pump room.

## 2.07 AUTOMATIC SEQUENCE OF OPERATION

- A. Controller: Provide a programmable, microprocessor-based controller to provide an automatic sequence of operation as follows:
1. Initiate transfer load to standby source: Signals from normal source monitor, emergency source monitor.
    - a. Normal Source Monitor: Initiate when normal source voltage drops below 70 percent from rated nominal value or frequency varies more than 10 percent from rated nominal value.
    - b. Emergency Source Monitor (Utility emergency source): Initiate when emergency source voltage is at least 90 percent of rated nominal value and frequency is within 5 percent of rated nominal value.
    - c. Emergency Source Monitor (Standby generator emergency source): Initiate when the standby generator source is at 98% rated voltage and 100% rated frequency.
    - d. Time Delay to Transfer Load to Emergency Source: Adjustable from 0 to 5 minutes, initially set at 2 seconds for ATS-03, 30 seconds for ATS-01 and 60 seconds for ATS-02.

2. Initiate retransfer load to normal source: Signals from normal source monitor and in-phase monitor.
  - a. Normal Source Monitor: Initiate when normal source voltage is at least 90 percent of rated nominal value and frequency is within 3 percent of rated nominal value.
  - b. Time Delay to Transfer Load to Normal Source: Adjustable from 0 to 30 minutes, set at 10 minutes. For loads connected to the emergency generator (ATS-02) the delay shall be adjustable from 0 to 120 minutes and shall be coordinated with the Standby generator controls. Bypass time delay in event of emergency source failure.
3. Final setting of timers shall be determined after Utility input is received and adjustments for series operation with other automatic transfer switches, the Engine-Generator and other switching equipment are determined.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Section 01732.
- B. Cable Connections: Terminate and label all field wiring per the approved diagrams.
- C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torque requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.
- D. Set all timers and sensor potentials per approved shop drawings and manufacturers recommendations.

#### 3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation. The correct timing of all transfer variations shall be demonstrated.
- C. Tests: Perform field tests as follows:
  1. Inspect and test the installation with respect to the safety requirements of NYCBC, NFPA 70 pertaining to grounding and insulation resistance.



2. Demonstrate proper operation of the automatic transfer switch by simulating conditions.
  3. Repair or replace defective materials at no cost to the City.
- D. Provide the services of the automatic transfer switch manufacturer's representative to assist in installation, start-up, field testing, calibration and placing into operation as specified in Section 16050 - Basic Electrical Materials and Methods. The representative is required to carry out a thorough inspection of the installation and certify that the installation is correct and complete in accordance with the manufacturer's instruction and to confirm that the automatic transfer switch is ready for the final acceptance.

### 3.03 OPERATION DEMONSTRATION

- A. Manufacturer's Representative: Provide the services of the automatic transfer switch manufacturer's representative to provide training, as specified in Section 01821 - Training.
- B. Training: Following completion of installation and field testing provide training for 12 employees of the DSNY in the proper operation, trouble-shooting and maintenance of the equipment as outlined below. All training will be at the DSNY's facilities at a time agreeable to the DSNY:
1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

### 3.04 PAINTING

- A. Shop Painting: Paint automatic transfer switches in accordance with Section 09912 - Interior Painting.
- B. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

-END OF SECTION-

**Section 16430**  
**480 VOLT SWITCHGEAR**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing, installing and testing 480-volt switchgear including the following major components:

1. Stationary structure including bus bars
2. Main and tie power air circuit breakers
3. Distribution power air circuit breakers
4. Control, protection, and metering equipment
5. Grounding System and provisions.

**1.02 RELATED SPECIFICATIONS**

1. Section 01821 - Training
2. Section 09912 - Interior Painting
3. Section 16050 - Basic Electrical Materials and Methods
4. Section 16060 - Grounding
5. Section 16080 - Electrical Testing Requirements
6. Section 16085 - Short Circuit and Coordination Study
7. Section 16121 - Wires and Cables - 600 Volts and Below
8. Section 16210 - Electric Service
9. Section 16491 - Control Components and Devices.

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NEC - National Electrical Code (NEC).
2. NYCBC - New York City Building Code
3. IEEE C37.13 - Low-Voltage AC Power Circuit Breakers Used in Enclosures
4. IEEE C37.20.1 - Metal-Enclosed Low Voltage Power Circuit Breaker
5. ANSI C37.51 - Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies
6. IEEE C37.90 - IEEE Standard for Relays and Relay-Systems Associated with Electric Power Apparatus

7. NEMA SG3 - Low-Voltage Power Circuit Breakers
8. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
9. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
10. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1 and N2 (Fed/mil H-q)
11. NEMA SG5 - Power Switchgear Assemblies
12. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
13. UL 1283 - Electromagnetic Interference Filters
14. UL 1449 - Surge Protective Devices
15. UL 1558 - Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
16. UL1066 - Low voltage AC and DC Circuit Breakers used in Enclosures.

B. Material Workmanship Requirements: Provide all materials and workmanship meeting the requirements of ANSI/NFPA Standards and Codes.

C. Design and Testing Requirements: Provide all switchgear components designed, manufactured and tested in accordance with the latest NEMA, IEEE and ANSI Standards, NYCBC, UL listed as well as appropriate seismic requirements.

D. Installation Requirements: Install the switchgear assemblies meeting the requirements of the NYCBC, NEC, local Electrical Codes and the manufacturer's instructions.

#### 1.04 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.

B. Product Data and Information: Furnish the following.

1. Manufacturers catalog data on switchgear assemblies and on each component detailing materials, ratings, type, model and reference number.

2. Layout drawings customized for the project including physical details, dimensions, clearances, mounting, elevations, sections, and nameplates.
  3. Electrical control schematics, wiring diagrams, internal interconnection diagrams and interconnection diagrams, including equipment external to the switchgear.
  4. Terminal lists for all connections.
  5. Furnish instruction booklets for each part included in the assembly and also time-current curves for each circuit breaker supplied.
  6. Furnish separate microprocessor-based metering systems for the A and B bus and individual circuit breaker overload protection systems address, memory map and instruction booklets.
  7. Furnish the following information on SPD Surge Protective Devices (SPD).
    - a. Verification that SPD SPD devices comply with UL 1449 and UL 1283 SVR. SPD shall have a minimum rating of 20KA and shall comply with NEC Article 285.
    - b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.
    - c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.
    - d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Note: Test data on individual modules are not acceptable.
- C. Contractors Drawings: Furnish switchgear installation details including concrete pad details, mounting details, conduit and cable termination details and shipping section split field connection details.

#### 1.05 QUALITY CONTROL

- A. Furnish the manufacturer's certified shop test report and field test report for each 480-volt switchgear.

## 1.06 OPERATIONS AND MAINTENANCE MANUALS

- A. Furnish operation and maintenance manuals, including spare parts lists, as specified in Section 01831.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1.
- B. Storage and Protection: Store all equipment in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

## 1.08 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. One transfer truck with fixed and swivel wheels and rubber tires suitable for moving the largest circuit breakers
  - 2. One portable circuit breaker test kit
  - 3. Two auxiliary power modules to power breaker trip units when breaker is not in the "connected" position
  - 4. One complete solid-state sensor unit for each size furnished
  - 5. Six replacement indicating light color lens for each color furnished
  - 6. Three current transformers of each type and rating
  - 7. Two potential transformers of each type and rating
  - 8. Twelve potential transformer primary fuses
  - 9. Twelve potential transformer secondary fuses
  - 10. Two sets of control jumpers
  - 11. One hand crank per switchgear for circuit breaker withdrawal and insertion
  - 12. Three 12-ounce spray cans of the final finish for touch-up
- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. 480-Volt Switchgear
  - a. Cutler-Hammer Magnum DS Low Voltage Metal Enclosed Switchgear using Magnum MDS drawout power circuit breakers with Digitrip RMS solid state tripping units.
  - b. Square D Company Power-Zone 4 Low Voltage Metal Enclosed Switchgear with Masterpact NW drawout power circuit breakers with Micrologic Ammeter RMS solid state tripping units.
2. Microprocessor Based Protective Relays and Metering Systems
  - a. Cutler-Hammer IQ-4000
  - b. Square D Company Powerlogic
3. SPDSurge Protective Devices (SPD)
  - a. Cutler-Hammer
  - b. Advanced Protection Technology
4. Programmable logic controller and Operator Interface Panel
  - a. Allen Bradley
  - b. Modicon

**2.02 SERVICE CONDITIONS**

- A. Utility Company Stationary Structure: The power supply to the switchgear will be from Consolidated Edison. Coordinate the circuit breaker trip units with the power company incoming feeder protection
- B. Switchgear
1. Provide metal enclosed switchgear with the following features:
    - a. Individually mounted, drawout power air circuit breakers
    - b. Isolate main and vertical bus from breaker compartments, cable compartments and between structures
    - c. Full insulated and isolated bus

- d. Insulated run back bus
  - e. Circuit breakers rated for 100 percent continuous ampere when installed in the switchgear enclosure
  - f. Interrupting rating of up to 200,000 rms symmetrical amperes as required by the short circuit coordination study at rated voltage
- 2. Label the switchgear suitable for use as service entrance equipment where appropriate.
  - 3. Provide all components required for complete functioning units as specified and as shown using factory built standardized units, completely dead front, totally enclosed and freestanding. Each unit comprises a stationary structure and a drawout circuit breaker.
  - 4. Design, manufacture and test all equipment in accordance with the Electrical Code for the City of New York, NFPA 70, NEMA SG3, and SG5; IEEE C37.13, C37.20.1 and C37.51 and UL 1558 Standards.
  - 5. Provide the required number of units based on the necessary controls and metering as shown and specified.
- C. Distribution System: Connect the switchgear to the Utility 480-volt, 3-phase, 60-hertz, 4-wire, solidly grounded neutral power system.

## 2.03 COMPONENTS

- A. Stationary Structure: Construct the stationary structure of the switchgear as follows:
- 1. Build each unit out of bolted structural steel members, together with formed or fitted sections of smooth sheet steel approximately 90 inches high.
  - 2. Form completely enclosed compartments for various combinations of circuit breakers and auxiliary equipment.
  - 3. Provide sufficient structural strength to support all the equipment mounted within, withstand the handling and shipment of the units, maintaining the proper alignment, and be rigid and freestanding. . Assembly shall meet seismic requirements.
  - 4. Provide a formed front door panel for each compartment consisting of concealed type hinges.
  - 5. Reinforce panels as required to retain alignment and to support instruments, relays, and control equipment mounted thereon.

6. Provide removable plates to permit access to all compartments individually.
7. Isolate circuit breaker, buses, and incoming or outgoing cables with separate compartments formed by sheet steel barriers.
8. Provide a circuit breaker cubicle that allows the front face of the circuit breaker to extend to the front of the switchgear enclosure or be enclosed behind the circuit breaker compartment door.
9. Provide suitable ventilation for the individual compartments to keep the temperature of devices and buses within the permissible temperature limits as specified by the Standards.
10. Include insulated buses, fixed portion of primary disconnect devices, instrument transformers, control devices and fuses in the stationary structure.
11. Provide a positioning mechanism for moving the removable circuit breaker to or from the connected position.
12. Provide guides for proper alignment of all engaging parts during movement of circuit breakers between the connected or disconnected position.
13. Provide stationary structure and circuit breakers that are interchangeable with every other circuit breaker of the same rating.
14. Extend the control and potential buses across all units of the switchgear.
15. Fully isolate the main bus compartment from the circuit breaker compartment and cable terminations.
16. Provide main buses rated not less than shown, consisting of rigidly supported insulated copper bars of suitable design and cross-sectional area to satisfactorily carry the rated current without exceeding the temperature rise as specified in the IEEE and NEMA standards. Bus size must also comply with the NYC Electrical Code requirements.
17. Connect the bus with bolts having locking type washers.
18. Tin plate the copper bars at current-carrying connections.
19. Equip each switchgear unit with a 1/4-inch by 2-inch bare copper ground bus with a momentary rating at least equal to the highest momentary rating of the unit's circuit breakers. Extend the ground bus the entire length of the structure and comply with all applicable codes and regulations.
20. Ground each stationary unit directly to the ground bus.



21. Provide suitable copper lug terminals on the ground bus for connections to the facility water main, the station grounding system and for termination of feeder equipment grounding conductors.
22. Construct and arrange the stationary structure so that circuit breakers are completely isolated from each other within the same section and that sections are isolated from adjoining sections.
23. Provide steel floor channels suitable for embedding into the concrete floor for leveling and anchoring the switchgear. Contractor to drill and tap the floor channels as required. Contractor to provide bolts, nuts, and washers for anchoring the switchgear to the channel.
24. Provide safety shutters to automatically isolate the breaker compartment from the main bus whenever the breaker is removed from the compartment. Also provide a removable cover to block any opening in the door when the breaker is removed.

**B. Switchgear Enclosure**

1. Provide switchgear suitable for installation indoors. Switchgear shall be rodent proof construction.

**C. Drawout Circuit Breakers and Tripping Units**

1. Provide 480 volt, 3-pole, 600-volt class, drawout-type, power fuse-less, circuit breakers with solid-state trip units rated as shown, having an interrupting rating adequate for the short circuit available at the location where it is installed. Provide breakers having a 100 percent ampere rating when installed in the switchgear enclosure. Breakers shall be listed to UL 1066.
2. Provide circuit breakers with trip free, manual-operating handles, stored-energy type trip mechanism and push-to-trip button; rated for 40 degrees C ambient operation.
3. Equip the circuit breaker with mechanical interlocks to prevent moving the circuit breaker to and from the connected position without the circuit breaker open.
4. Provide circuit breakers that cannot be closed at any point between the operating and test positions or when the key interlock is engaged.
5. Provide means to padlock the circuit breaker in the disconnect position.

6. Provide manually-operated circuit breakers except for the following electrically operated circuit breakers as shown:
  - a. Main circuit breakers
  - b. Tie circuit breaker
  - c. Generator circuit breaker
  - d. Gantry Crane circuit breakers
7. Provide electrically operated circuit breakers suitable for 120 volts ac operation. Provide all auxiliary relays, breaker contacts, electrical interlocks and cell position switches to accomplish the operation shown, specified or required. Although not shown in the breaker schematic, wire electrical interlocks and cell position switches to allow the main and tie breakers to function when any breaker is not in the connected position. Provide cell position switch contact inputs to PLC.
8. Provide control connections between the stationary structure and removable circuit breaker that have floating terminals mounted in the stationary structure and engaging mating contacts on the breaker that are engaged when the breaker is in either the connected or test position.
9. Provide each circuit breaker with true rms sensing and microprocessor-based logic circuitry having the following protection features for tripping the circuit breaker.
  - a. Trip Indicators
  - b. Long time setting and time delay
  - c. Short time setting, time delay and  $I^2t$  response.
  - d. Instantaneous setting (distribution circuit breakers only feeding single transformer or single motor).
  - e. Ground fault setting, time delay and  $I^2t$  response.
  - f. Short time and ground fault zone interlocking.
10. All circuit breakers shall be fully rated and selectively tripped. No series rated circuit breaker applications will be accepted.

#### D. Switchgear Connections and Terminals

1. Construct all current-carrying connections of copper having suitable capacity, bracing, insulation, temperature rating as the main bus.

2. Connect current transformers in such a way that the transformers may be removed and changed without damaging the connection.

E. Instrument Transformers

1. Current Transformers

- a. Provide dry type current transformers, suitable for indoor service and rated as shown.
- b. Provide sufficient thermal and mechanical capacity to withstand the maximum momentary current rating of the circuit breaker.
- c. Provide solderless, clamp type shorting terminal blocks for secondary connections.
- d. Properly identify the polarity of all current transformers with standard marking symbols.
- e. Provide current transformers having an accuracy suitable for the instruments and meters specified using the normal burdens of the various devices, and not less than ANSI Standard requirements.

2. Potential Transformers

- a. Provide dry type potential transformers, suitable for indoor service. single-phase, 60 hertz, 120 volts.
- b. Provide potential transformers that fit into and coordinate with the complete switchgear units, and with the instruments, relays, meters, and devices specified.
- c. Rate the potential transformers not less than 100-volt-amperes at 55 degrees C ambient or 150-volt-amperes at 30 degrees C ambient thermal rating.
- d. Provide potential transformers that can withstand a secondary short circuit for at least one second.
- e. Provide the transformers meeting the requirements of the ANSI Standard accuracy classifications.
- f. Provide current-limiting type primary fuses.
- g. Provide secondary fuses sized for the protection of potential transformers.

**F. Grounding**

1. Ground current and potential transformer secondaries with copper conductors not smaller than No. 10 AWG and connecting to the ground bus.
2. Ground potential transformer neutrals, where shown or required with a 600-volt green insulated copper conductor not smaller than No. 10 AWG.
3. Provide connections to the bus that can be easily disconnected and isolated for field testing individually.
4. Install each ground wire as a continuous run without intervening splices or terminal blocks.
5. Ground secondary circuits of metering and relaying transformers at one point only.
6. Effectively ground meter, relay and instrument transformer cases.

**G. Lightning Arresters and Surge Capacitors**

1. Provide lightning arresters and surge capacitors for each incoming service, if required.

**H. Control Devices**

1. Provide control switches of the standard rotary, multistage type suitable for the use specified.
2. Provide auxiliary relays, switches and mechanisms required for the particular manufacture of the breaker.
3. Provide a manually-operated trip bar or lever for each circuit breaker.
4. Provide provisions for manual closing of each circuit breaker.

**I. Microprocessor-Based Metering and Protection System: Provide a microprocessor-based metering and protection system for the Switchgear Mains, tie and each low voltage power air circuit breaker having the following features:**

1. UL recognized component meeting IEEE C37.90
2. Housed in an enclosure suitable for door mounting
3. Derive control power from metered line

4. Auto ranging metering of the following values:
    - a. AC amperes in each phase, 0.5 percent accuracy
    - b. AC voltage, phase-to-phase, phase-to-neutral, 0.5 percent accuracy
    - c. Watts, 1 percent accuracy
    - d. Vars, 1 percent accuracy
    - e. Power factor, 2 percent accuracy
    - f. Frequency, 0.5 percent accuracy
    - g. Watt demand, 1 percent accuracy with programmable 5-, 10-, 15-, 30-minute intervals
    - h. Watt-hours, 1 percent accuracy
    - i. Percent total harmonic distortion through the 31st harmonic
  5. Protection system with the following functions:
    - a. Voltage phase loss, less than 50% nominal line voltage
    - b. Current phase loss, less than 1/16 of the largest phase
    - c. Voltage phase unbalance, 5 to 40% in 5% increments
    - d. Phase voltage reversal
    - e. Overvoltage, 105 to 140% in 5% increments
    - f. Undervoltage, 95 to 60% in 5% increments
    - g. Time delay for overvoltage, undervoltage, and phase unbalance, zero to twenty seconds in one second intervals.
  6. Separate Form C (NO/NC) trip and alarm outputs contacts rated 10 amperes at 115-volt ac or 30-volt dc resistive.
- J. Transfer System: Furnish a transfer system consisting of the following features.
1. Automatic Operation: Provide automatic Operation of the transfer to follow the operational sequence in 2.05.
    - a. Programmable logic controller with operator interface panel
    - b. Operator Interface Panel: 10-inch diagonal, AMTFT, touch screen color panel, provided with replaceable backlight housed in an enclosure suitable for door mounting. Mount the screen so it is clearly visible and operable by a person standing in front of it on the floor. Provide the following graphical indication:
      - (1) Status of all breakers controlled
      - (2) Incoming Service for Utility source 1 and 2 and the generator.

- (3) A digital readout that displays each option as it is functioning and include, but not limited to the following
    - (a) Actual line-to-line voltage
    - (b) Line frequency
    - (c) Timers with count down timing
  - (4) Provide an operator keypad to allow setting of all programmable parameters.
  - (5) Provide a time delay transfer from the one utility source to the other utility source (0 seconds to 30 minutes).
  - (6) Provide a time delay transfer from the Utility source to the emergency source (0 seconds to 30 minutes).
  - (7) Provide a time delay transfer to start the standby generator (0 seconds to 120 seconds).
  - (8) Provide a time delay to confirm loss normal source after generator starts (0 seconds to 30 seconds).
  - (9) Provide a time delay to transfer from the emergency source to normal source (0 seconds to 60 minutes).
  - (10) Under voltage sensing adjustable from 50 to 90 percent of nominal.
  - (11) Under frequency sensing adjustable from 90 to 100 percent of nominal.
2. The system shall also provide manual circuit breaker control subject to the Utility requirements.
  3. Safety features and required prevention (non-paralleling of Utility sources and non-paralleling of any Utility source with the standby Engine-Generator) shall be accomplished with switches, breaker contacts and hard wired logic.
  4. Obtain Con Edison (Utility) approval for the Switchgear, the transfer scheme and Engine-Generator connection to the Switchgear. Fill out and submit any approval forms required by the Utility.

K. Surge Protective Device (SPD)

1. Provide SPD equipment that is UL Listed and Labeled, complies with UL 1449 and UL 1283 and NYCEC Article 285..

2. Provide units with a maximum continuous operating RMS voltage of 115 percent of the nominal system operating voltage.
3. Provide SPD equipment suitable for wye-configured systems.
4. Provide SPD equipment having directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).
5. Provide SPD equipment that distributes the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.
6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise at least 55 dB at 100 kHz using the MIL-STD-220A insertion loss test method.
7. Wire internal components with connections utilizing low impedance conductors and compression fittings.
8. Provide a monitoring panel for each system that incorporates the following features:
  - a. Green/red solid state indicator light to indicate which phase(s) have been damaged
  - b. A flashing trouble light to indicate fault detection
  - c. Transient event counter
  - d. Audible alarm
  - e. Form C dry contacts for remote indication of the unit status
9. Provide each SPD for service entrance location application with a minimum total surge current capable of withstanding 250kA per phase.
10. Provide properly sized molded case circuit breaker disconnect for each SPD unit. Connections from the main bus to the SPD unit shall be of minimum length of copper bus or twisted cables.

L. Wiring

1. Completely assemble, wire and test each switchgear section at the factory, including buses, phase, neutral and ground connections, insulators, cleats, terminals, and terminal blocks.

2. Route all secondary wiring in the front of secondary compartments in wiring troughs and terminate at approved, molded-type terminal blocks with numbered marking strips, conveniently located with respect to the control conduits.
3. Provide terminal blocks with covers mounted so that the wires can be grouped and laced together.
4. Mark and identify all wiring in accordance with the manufacturer's wiring diagrams.
5. Label control wiring with an identification tag that indicates the terminal number of the opposite end connection.
6. Include wire labels and terminal numbers on schematic control and wiring diagrams.
7. Provide spade connectors for wires No. 12 and smaller and solderless lugs for larger sizes.
8. Provide terminals for all connections and an additional 15 percent spare terminals for all control and instrument wiring.
9. Provide No. 10 AWG stranded copper or larger with NEC Type SIS insulation for all current transformer secondary wiring.
10. Provide No. 14 AWG stranded copper or larger with NEC Type SIS insulation for all other control wiring.
11. Provide a fused switch or circuit breaker for each control power supply in each breaker compartment.

**M. Identification**

1. Provide identification of the switchgear and its components as specified in Section 16075 - Electrical Identification.
2. Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.
3. Locate nameplates so that they are readily associated with the items labeled.
4. Where nameplates are installed on removable relays or removable device doors, install a nameplate within the relay or device.
5. Where nameplates are located on other compartments than those served, add additional engraving to identify units served.



6. Provide Mimic Bus.
7. Provide labels required to comply with NYCEC 110.16 Flash Protection.

#### 2.04 ACCESSORIES

- A. Circuit Breaker Lifting Device: Provide a traveling type circuit breaker lifting device rail mounted on the top of each switchgear assembly. Provide all accessories required for lifting and lowering circuit breakers.

#### 2.05 OPERATION SEQUENCE

- A. Design the transfer logic controller system to operate as follows:
  1. Operational Overview
    - a. Coordinate and integrate the system operation and control functions such that during automatic and/or manual operation, no unsafe condition can occur including paralleling the generator with ConED.
    - b. Include a Manual-Automatic control mode selector switch in control transfer logic controller. In the Manual mode, all control functions will be manually performed by the operator. In the Automatic mode all control functions will be automatic except for specific steps described herein, which require the operator to initiate the procedure.
    - c. Automatic control of the 480 Volt Switchgear main circuit breakers (52-M1 & 52-M2); tie breaker (52-T), generator breaker (52-G1) and the gantry crane feeder breakers (52-B1 & 52-A1) will be through the transfer logic controller.
    - d. Provide electrical interlocks that allow the following when the transfer controller is in Manual mode:
      - (1) When operating from Con Edison, only two of the three main-tie main breakers can be closed at one time to prevent failure of both utility feeds due to the same event.
      - (2) When operating from the standby generator, the main breaker (52-M2) and tie breaker (52-T) has to be open to prevent paralleling the generator with ConED service. Also Gantry Breakers 52-A1 and 52-B1 shall be open whenever the generator is operating.
    - e. Provide cell-switches that functionally indicate when a breaker is in either the operating or test position. Incorporate cell switch contacts into the breaker control circuit to allow testing a breaker in the test position without affecting or tripping any other breaker.

- f. Normal operating condition of the switchgear is with both main breakers closed and the tie breaker open.
- 2. Loss of one ConEdison feeder
  - a. Design the main and tie circuit breakers to operate as follows:
    - (1) When the control mode selector switch is in the AUTOMATIC position:
      - (a) Trip associated main breaker when the transfer logic controller senses a sustained undervoltage.
      - (b) Close the tie breaker, after the affected main breaker opens. Provide interlocks to prevent closing tie breaker, if the undervoltage is due to a fault condition.
      - (c) When voltage returns on the affected service, after an adjustable time delay of 0 to 30 minutes, automatically open the Tie Breaker and then transfer back to original circuit breaker position unless the manual retransfer option is selected.
    - (2) When the control mode selector switch is in MANUAL position:
      - (a) Open and close circuit breakers by using the breaker control switch, subject to the restraints given in 2.05 A1 d..
- 3. Loss of Utility Sequence (Total Con Edison Power Failure)
  - a. Provide interconnecting control circuits to produce the following normal operating functions when both Con Edison Service Lines No. 1 and No. 2 fail.
    - (1) When the control mode selector switch is in the AUTOMATIC position:
      - (a) Failure of both Con Edison service lines, initiates an adjustable time delay of.
      - (b) At the end of the time delay, open both main breakers (52-M1 & 52-M2), tie breaker (52-T) and the gantry crane feeder breakers (52-B1 & 52-A1).
      - (c) Automatically start the generator.

- (d) Upon sensing that the generator has attained 90 percent voltage and frequency, after an adjustable time delay of 0 to 30 seconds to allow for a voltage check of both Con Edison service lines, close generator breaker (52-G1).
- (2) When the control mode selector switch is in MANUAL position:
  - (a) Open and close circuit breakers by using the breaker control switches. Provide interconnecting control circuits to produce a start command to the standby generator. Provide hard wired control logic to prevent closing the Generator breaker (52-G1) if either main breaker (52-M2) or tie breaker (52-T) are closed and prevent closing main breaker (52-M2) and tie breaker (52-T) if the generator breaker (52-G1) is closed.

#### 4. Return of Utility Sequence (Con Edison Power Available)

- a. When voltage returns to both Con Edison service lines and after an adjustable time delay of 0 to 30 minutes, initiate automatic restoration of both Con Edison service lines as follows unless manual restoration option is selected:
  - (1) Open Tie Breaker 52-T, close main breaker (52-M1), open the generator breaker (52-G1) and close the remaining main breaker (52-M2). After an adjustable time delay of 0 to 10 minutes, close gantry crane feeder breakers (52-B1) and shut down the generator.

### 2.06 SOURCE QUALITY CONTROL

- A. Conduct shop tests after the switchgear has been assembled to determine general operating condition and circuit continuity, high voltage withstand and other safety standards.
- B. Witness Tests: Carry out inspection and witness test of the completed switchgear assembly to assess its state of workmanship and standard of performance.
- C. Notify the Resident Engineer of the proposed date of testing a minimum of ten working days prior to the test.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install the switchgear in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Section 01732.

- B. Conformance: Install the switchgear as shown, in conformance with manufacturer's written instruction and recognized industry practices. Comply with requirements of NEMA standards, and applicable ANSI publications.
- C. Coordination: Coordinate with other work including cabling and wiring work as necessary to interface installation of switchgear. Also coordinate the installation of the Utility Metering Cubicles to be located at each end of the switchgear. Extend phase and ground bus for the power connection.
- D. Torque Requirements: Tighten electrical connectors and terminals including screws and bolts, in accordance with equipment manufacturer's published torque tightening values of equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.
- E. Fuses: Provide fuses in switchgear assemblies as required.
- F. Circuit Breaker Parameters: Set the circuit breaker protection parameters in accordance with the protective coordination study specified in Section 16085 - Short Circuit and Coordination Study.
- G. Grounding Connections: Make equipment grounding connections for the switchgear as shown. Tighten connections in accordance with UL standard 486A for permanent and effective grounding.
- H. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation of the system.
- I. Provide a full size print of the switchgear one-line, switchgear elevation and updated E-111 or actual control scheme as provided, framed under glass. Install in the Pier Level Electrical Equipment Room.

### 3.02 FIELD QUALITY CONTROL

- A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the switchgear manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01821 - Training. Provide all instruments and equipment necessary to conduct required tests, adjustments and training. Have the manufacturer's representative utilize prepared comprehensive check sheets covering inspections, checks and tests required for the assembly of the switchgear. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

- B. Certified Report: Furnish a written report certifying that the equipment:
1. Has been properly installed
  2. Is in accurate alignment
  3. Is free from any undue stress imposed by connections or anchor bolts, and
  4. Has been operated under full load conditions and that it operated satisfactorily
- C. Tests and Inspections: Perform the following tests and inspections. Record all tests and submit a written report for approval. Retest as necessary.
1. Check all breakers, relays, meters, power and control fuses and auxiliaries for proper size, rating, and location. Clean control panels and cubicles. Remove all shipping materials.
  2. Inspect equipment and each breaker and report installation or shipping damage, loose materials, shipping blocks or contamination.
  3. Torque test bus connections where field joints are made.
  4. Check that all control and panel circuits are numbered and tagged and panel door legends are engraved and installed as per drawings.
  5. Check equipment to determine that it is level, secured to foundations and that doors operate properly.
  6. Test insulation of all control and relay circuits to ground with a suitable megohmmeter. Take suitable precautions where electronic devices, instruments and instrument transformers are involved.
  7. After installation, but before any external connections are made to the switchgear, subject the switchgear to a 10-minute high potential test applied on the stationary structure and breakers. Use a test voltage of 75 percent of the standard factory production tests.
  8. Test all bus, cable, wire and other equipment operating at the service voltage that is energized by closing the incoming main line breakers. This test may be witnessed by the Resident Engineer.
  9. Test protective relays to verify settings and determine proper operation.

D. Training: Following completion of installation and field testing provide training for employees of the City in the proper operation, trouble-shooting and maintenance of the equipment as described in Section 01821 – Training.

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

### 3.03 GROUNDING

- A. System Inspections: Inspect ground system for compliance with the latest approved drawings.
- B. Connection Inspections: Inspect all ground connections for evidence of looseness and/or corrosion.

### 3.04 PAINTING

- A. Shop Painting: Paint the switchgear as specified in Section 09912 - Interior Painting.
- B. Field Painting: Touch up scratched and marred surfaces to match with original finishes.

### 3.05 IDENTIFICATION

- A. General: Provide identification meeting the requirements of Section 16075 - Electrical Identification.
- B. Component Identification: Identify all system components, cables and wires by labels indicating unit numbers, circuit numbers and date of installation.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16443**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for providing lighting and distribution panelboards including circuit breakers and cabinets.

**1.02 RELATED SPECIFICATIONS**

1. Section 09912 - Interior Painting
2. Section 16050 - Basic Electrical Materials and Methods
3. Section 16075 - Electrical Identification
4. Section 16085 - Short Circuit and Coordination Study

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NEMA PB 1 - Panelboards
2. UL 67 - Panelboards
3. Fed. Spec.W-P-115 - Power Distribution Panel
4. UL50 - Cabinets
5. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
6. NEC - National Electrical Code
7. NYCBC - New York City Building Code

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish the manufacturer's catalog data for panelboards, circuit breakers and accessories.
- C. Shop Drawings: Provide drawings of all the different type of panels and cabinets to be provided. Clearly indicate all gutter sizes, bus locations, main breaker or lug



locations and any special construction required. Provide individual breaker layouts and schematics for each panel

- D. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for the panelboards as specified in Section 01831.

## 1.05 QUALITY ASSURANCE

- A. Codes: Provide all materials and workmanship meeting the requirements of the NFPA, the NYCBC, National Electrical Code and local codes.

1. Design, fabricate and test the panelboards in accordance with applicable ANSI, IEEE and NEMA standards.
2. Provide panelboards suitable for operation at their standard nameplate ratings in accordance with ANSI standards.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  1. General Electric Company
  2. Cutler Hammer

### 2.02 MATERIALS

- A. General: Provide factory-assembled fully rated dead-front panelboards suitable for surface or flush mounting as indicated on the drawings. Provide branch circuit breakers individually bolted to the individual bus bars and a separate vertical main circuit breaker or main lugs as indicated, located at the top of the Panelboard.
- B. Provide panelboards with a full capacity separate ground bus and when connected to a three-phase four-wire or a single-phase three-wire service, also supply an insulated neutral bus. The total number of overcurrent protective devices shall be limited to 42 single pole connections or the equivalent multi-pole load.
  1. Provide The total number of overcurrent protective devices shall be limited to 42 single pole connections or the equivalent multi-pole load.
  2. Provide panelboards with the voltage, frequency and current ratings as indicated conforming to NEMA Standard PB 1, Fed. Spec. W-P-115, UL 67 and the NYCBC, NEC.
  3. Provide panelboards with copper main, neutral and ground buses.

4. Provide sequence phase connection of all branch circuits to the main bus.
  5. Where required, provide panelboards suitable for use as service entrance equipment.
  6. Where required to meet code, in fuel dispensing areas, provide panelboard with capacity to switch any neutral run in a branch circuit supplied from that panelboard.
  7. The total number of overcurrent protective devices shall be limited to 42 single pole connections or the equivalent multi-pole load.
- C. Bracing: Provide main bus bracing exceeding the short circuit available at the panel bus and the interrupting rating of any circuit breaker installed.
- D. Fabrication: Fabricate panelboards using galvanized steel, continuously welded to provide a NEMA 12 enclosure. Provide cabinet fronts with doors over the circuit breakers. Provide doors fastened with concealed hinges and equipped with vault handle catches.
1. Provide panelboards at least 20 inches wide, 5-3/4 inches deep, with full wiring gutters on all sides. Where larger panelboards are required they shall fit in the space available.
  2. Provide all panelboard trims exceeding five square feet in area with an inside permanently secured angle to support the trim during fastening.
  3. Panelboards shall be suitable for industrial service and for the environment where they are located.

## 2.03 CIRCUIT BREAKERS

- A. Provide bolt-on heavy duty industrial type branch and main circuit breakers. No Q frame or miniature circuit breakers shall be supplied for this project.
- B. Furnish the frame sizes, trip settings and number of poles as indicated. Mark ampere trip rating on the circuit breakers clear and visible.
1. For lighting and appliance panelboards, provide 20-ampere, single-pole, 120 or 277 volt circuit breakers, unless otherwise shown or scheduled, suitable for switching service and with HID and fluorescent lighting loads.
  2. For distribution panelboards, provide 20-ampere, three-pole, 600-volt circuit breaker, unless otherwise shown or scheduled.
- C. Provide all breakers with quick-make, quick-break, toggle mechanisms with automatic thermal-magnetic, inverse time-limit overload and instantaneous short circuit protection on all poles, unless otherwise indicated. Indicate automatic

tripping by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Design the breaker handle to be trip-free on overloads.

- D. Interrupting Rating: 10,000 rms symmetrical amperes for circuit breakers on 240 volt systems or less, and 35,000 rms symmetrical amperes for circuit breakers on 277 or 480 volt systems but not less than the available short circuit as determined by the Short Circuit and Coordination Study in Section 16085.
- E. Provide multipole breakers that utilize a common tripping bar.
- F. Provide ground fault interrupter circuit breakers for all circuits serving receptacles located below grade and outdoors and as scheduled.
- G. Provide full 1" module size single-pole breakers. Do not install two-pole breakers in a single-pole module.
- H. All circuit breakers shall be fully rated. No series rated combinations will be acceptable.

## 2.04 ACCESSORIES

- A. Directories: Provide directories in accordance with Section 16075 - Electrical Identification. Provide frames with rigid clear plastic covers.
- B. Circuit Breaker Handle Lock: Where shown provide circuit breakers with handle clamp that holds the circuit breaker handle in the ON position.
- C. Keying: Key all panelboards alike to the City of New York's requirements.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all panelboards in accordance with manufacturer's recommendations and approved shop drawings and as specified in Section 01732 and in compliance with the requirements of NEMA standards, NYCBC, NEC, and applicable ANSI Publications.
- B. Mounting Height: Mount all panelboards either surface or flush mounted as shown such that the height of the top operating handle does not exceed 6 feet 6 inches from the floor.
- C. Coordination: Coordinate with other Work including cabling and wiring work to interface the installation of the panelboards.
- D. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with the equipment manufacturer's published

torque tightening values for the equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL 486A.

- E. Circuit Breaker Handle Lock: Install circuit breaker handle clamp on each circuit breaker where shown.
- F. Directory: Provide a laminated typewritten directory with the following information:
  - 1. Circuit number
  - 2. Area served
  - 3. Utilizing equipment
- G. In damp, wet or corrosive locations, mount panelboards on standard channels to permit air to circulate behind the cabinet. Channel shall be corrosion resistant.

### 3.02 PAINTING

- A. Shop Painting: Paint the panelboards as specified in Section 09912 - Interior Painting.
- B. Field Painting: Touch up scratched and marred surfaces to match the original finish.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16445**  
**MOTOR CONTROL CENTERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing new motor control centers.

**1.02 RELATED SPECIFICATIONS**

1. Section 01821 - Training
2. Section 09912 - Interior Painting
3. Section 16050 - Basic Electrical Materials and Methods
4. Section 16075 - Electrical Identification
5. Section 16121 - Wires and Cables - 600 Volts and Below
6. Section 16491 - Control Components and Devices

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. IEEE C37.90 - IEEE Standard for Relay and Relay Systems Associated With Electrical Power Apparatus
2. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
3. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
4. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1 and N2 (Fed/mil H-q)
5. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC
6. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies
7. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
8. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors
9. UL 845 - Motor Control Centers

- 10. UL 1283 - Electromagnetic Interference Filters
- 11. UL 1449 - Surge Protective Devices

#### 1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.
  - 1. Provide motor control centers designed for 480-volt, three-phase, three-wire, and ground, 60-hertz operation.
  - 2. Provide all control devices in the center suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.
  - 3. Provide all control equipment and devices that meet the requirements of the 600-volt insulation class.
  - 4. Provide motor control centers to include the indicated number of 20 or 21-inch deep sections and the components arranged as shown.
  - 5. Arrange the equipment for convenient and ready accessibility from the front for inspection and maintenance of devices, terminals and wiring.
  - 6. Where shown or required, label the motor control center suitable for use as service entrance equipment.

#### 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Provide catalog data for all associated equipment and devices.
- C. Shop Drawings: Furnish shop drawings customized to the project for motor control centers to include the following:
  - 1. Outline drawings showing dimensions, weights, arrangement, elevations, identification of components and a nameplate schedule for all units.
  - 2. Bill of materials including manufacturers' name and catalog number.
  - 3. Interconnecting wiring diagrams, where required.
  - 4. Individual schematic and wiring diagrams for each compartment.

5. Furnish details showing electrical connections between main and tie circuit breakers and corresponding main buses.
  6. Furnish instruction booklets and time-current curves for each circuit breaker supplied.
  7. Furnish microprocessor-based metering system and overload protection systems address, memory map and instruction booklets.
  8. Furnish the following information on Surge Protective Devices.
    - a. Verification that SPD devices comply with UL and NYCEC Article 285.
    - b. Let through voltage test for combination and ringwaveper ANSI/IEEE.
    - c. Spectrum analysis test verifying that the device's noise attenuation exceeds an acceptable level for this application Between 50 Hz and 200 KHz.
    - d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive at the published surge current ratings.
  9. Obtain and enter full performance details on all motors and other equipment being served on the above drawings.
  10. Supply mounting details that comply with the Seismic requirements.
- D. Quality Control: Furnish the following test reports and certificates as specified in Division 1:
1. Certified Shop Test Reports for motor control centers and related components. Provide a minimum of 15 days written notice prior to shop tests.
  2. Detailed field test reports of all tests indicating test performed as specified, discrepancies found, and corrective action taken.
- E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals as specified in Section 01831.
- 1.06 QUALITY ASSURANCE
- A. Standards: Provide motor control centers in accordance with NEMA ICS 2, ICS 3, and UL Standard No. 845.



- B. Codes: Provide motor control centers in accordance with the NYCBC, NEC and local codes.
- C. UL Label: Provide a UL Label on each vertical section of each motor control center.
- D. Seismic Certification: Furnish certification of seismic testing.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 1.
- B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.
- C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

#### 1.08 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. One set of contact tips, control power transformers and operating coils for each six or less of each size of motor starter.
  - 2. One auxiliary contact unit or one set of auxiliary contact tips for each six or less motor control units.
  - 3. Ten percent but not less than two complete control, latching and timing relays of each type used in motor control centers.
  - 4. Two complete replacements of overload heater units for each catalog number installed in motor control centers and motor starters.
  - 5. Two complete replacements of all LED indicating lamps and fuses used in the installation.
  - 6. One complete magnetic starter with motor circuit protector for each size required.
  - 7. Two sets of replacement indicating light color lenses of each color furnished.
  - 8. One circuit breaker test unit.
  - 9. Three 12-ounce spray cans of the final finish for touch-up

- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
  - 1. Motor Control Centers
    - a. Cutler-Hammer 2100 Series
    - b. General Electric Company Evolution Series E9000
  - 2. Transient Voltage Surge Suppression (TVSS)
    - a. Cutler-Hammer
    - b. Advanced Protection Technology

### 2.02 MOTOR CONTROL CENTER

- A. Basic Structural Components: Provide totally enclosed, dead-front, rigid, NEMA 12, gasketed, self-supporting and freestanding structures suitable for industrial application.
  - 1. Construct the various sections from channels not less than 12 gauge, formed into proper shape, suitably reinforced and welded. Construct rigid doors and covers from a minimum 14 gage steel sheets, folded and hemmed. Grind all internal welds smooth and round off all corners to give a neat and pleasing appearance.
  - 2. Provide steel bottom plates in each compartment section.
  - 3. Cover the rear of each structure with easily removable steel panels for rear access.
  - 4. Provide both ends of a completely assembled center so that extensions can be easily added in the future.
  - 5. Provide hinges, screws, bolts, circuit breaker operating mechanisms, nameplate mounting screws and other metallic appurtenances with a non-corrodible metal covering.
  - 6. Install full height steel barriers on each side of the tie breaker structure to prevent the passage of flames and ionized gases.

7. Provide each motor control center with a three-phase bus compartment at the top and a conduit and cable compartment at the top and bottom.
8. Provide the cable compartments that run the full length of the motor control center.
9. Provide access to cable compartments by means of removable hinged doors.
10. Provide each structure with a vertical wiring space between the starter cells and side sheet for unit wiring.
11. Equip the vertical wiring space with cable supports to hold the cables and wiring in place.

**B. Motor Control Center Enclosure**

1. Provide motor control centers suitable for installation indoors in an industrial environment.
2. Assembly shall be rodent proof construction.

**C. Bus Requirements: Provide main buses of silver plated copper bars across each structure, sized in accordance with UL temperature rise of 50 degrees C based on a 40-degree C ambient temperature and in conformance with the NYCBC.**

1. Provide a 600-ampere minimum, main horizontal bus, unless otherwise shown.
2. Support all bus bars in each structure by means of bus supports fabricated from an insulating material. Construct the main bus with a minimum number of splices.
3. Connect the horizontal bus to the incoming line circuit breakers and from both sides of the tie breaker with copper bars, securely fastened in place.
4. Provide tin-plated vertical three-phase copper bus of sufficient size to carry loads served.
5. Insulate main and vertical buses over their entire length. Provide insulated covers over all bolted connections.
6. Separate the bus bar compartments from breaker and controller cubicles by insulated barriers or steel plates.
7. Provide a 300-ampere continuous uninsulated copper grounding bus in the bottom of each motor control center. Provide copper lugs for connection of all supply and distribution feeders equipment grounding conductors.

8. Brace all bus work suitably to withstand a minimum of 100,000 rms amperes symmetrical short circuit current. Substantiate construction by a certified laboratory test covering units of similar construction.
- D. Individual Units: Provide motor controller, contactor, circuit breaker or MCP spares and spacers in combinations of not less than 12-inch modular heights. Compartments with additional relays, timers and other devices that exceed the reasonable capacity of the standard 12" module may be expanded in 6" modules to gain room to provide adequate space for testing, maintenance, adjustment and replacement of parts. No unit shall be jammed with parts, wiring and devices such that it makes maintenance difficult or unsafe.
1. Provide units of the plug-in or nonremovable type in accordance with the manufacturer's standard for type and size of controller.
  2. Provide plug-in units within-plated, pressure-type line disconnecting stabs of high strength copper alloy. Hold each plug-in unit in place and arrange the units such that they can be removed or remounted readily without access to the rear of the structure.
  3. Provide units that are totally enclosed and effectively baffled to isolate ionized gases that may occur within each unit. In addition, ventilate each unit so that it can be located anywhere within the structure using the same overload heaters for the same load.
  4. Provide automatic shutter mechanism to cover the vertical bus stub area when a unit is removed.
  5. Provide spaces for future equipment in unit structures with blank hinged doors and removable metal barriers for isolation of the vertical buses.
  6. Construct doors to be drip-proof and dust-tight. Provide all doors with hinges and screw fasteners for holding the doors closed. Fabricate each door as a part of the structure and not part of the unit.
  7. Equip the doors for motor control compartments with a motor circuit protector operating mechanism, thermal overload relay reset mechanism, controls and indicating lights and other required devices as shown.
  8. Equip the doors for branch feeder equipment with a circuit breaker operating mechanism.
  9. Provide mechanical interlocks between the compartment door and circuit breaker operating mechanism to prevent opening of the door unless the breaker is in the OFF position, and to prevent closing the breaker unless the door is fully closed.

10. Provide circuit breaker operating mechanisms or handles that are padlockable in the OFF position with room for a minimum of three padlocks.
11. Provide units having devices that are serviceable from the front, without provisions for rear access.
12. Provide control power transformers, relays, timers, alternators and accessories for each unit as shown or specified.
13. Interior of the individual units shall be painted white or other approved finish to improve visibility inside the unit.

E. Wiring

1. Provide NEMA Class II Type B wiring for the motor control centers, including internal interlock and internal wiring between controller units and devices.
2. Provide internal wiring runs for interconnecting units with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Provide No. 14 AWG wire for control interconnections. Provide power connections as required for the service.
3. Provide wire markers at each end of all wires and tag all terminals to match..
4. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.
5. Provide the wiring of all control connections to individual terminal blocks at each motor starter. Locate terminal blocks for front access.
6. Provide interlocking wiring between units of a motor control center or between units of grouped centers as internal wiring with terminals provided for external connections.
7. Provide sufficient pull apart terminal blocks for all devices external to the motor control center.
8. Provide communication cables from the microprocessor-based metering system and microprocessor-based overload protection systems to a single terminal block located in the incoming line structure.

- F. **Magnetic Starters:** Provide 480-volt, 3-phase, 60-hertz across-the-line combination motor circuit protector and magnetic starters having individual control power transformers.
1. Provide full-voltage nonreversing; full voltage reversing; full voltage two-speed nonreversing two-winding; and full voltage two-speed nonreversing one-winding starters as required.
  2. Provide starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide-plated contact surfaces. Provide replaceable coils of the epoxy sealed type.
  3. **Thermal Overload Elements:** Provide each magnetic starter unit with a Class 20 thermal overload element and all required accessories. Provide size five and larger starters with current transformer operated overload relays.
    - a. Provide overload relays of the bimetallic type with an adjustment knob that allow plus or minus 15 percent adjustment of the nominal heater rating.
    - b. Provide and adjust overload relays to match the associated motor nameplate running current rating. Size the overload relays after approval of the corresponding motor.
    - c. Provide a set of isolated normally-open and normally-closed contacts for each overload relay.
  4. **Replaceability:** Provide starters having component parts that are easily replaceable.
  5. Equip each starter with all required auxiliary contacts.
- G. **Motor Circuit Protectors:** Provide a motor circuit protector for each combination starter serving a motor load using molded-case, air-break type designed for 600-volt, 60-hertz service with an interrupting capacity of 100,000 rms symmetrical amperes at 480 volts. Provide three-pole motor circuit protectors with magnetic, adjustable-trip units actuating a common tripping bar to open all poles when an overload or short circuit occurs. Provide motor circuit protectors with no thermal elements. Provide magnetic trip units capable of being adjusted from 700 to 1,300 percent of the motor full load amperes.
- H. **Contactors:** Provide NEMA sized, 30 ampere minimum, contactors for electric heating and other nonmotor loads equal to the motor starters except without overload relays or heaters.
- I. **Feeder Circuit Breakers:** Provide molded-case type, two- or three-pole feeder circuit breakers as shown, with a minimum voltage rating of 600-volt ac. Breakers

shall be heavy duty, industrial class. No Q frame or miniature circuit breakers will be accepted.

1. Interrupting Ratings: Provide an interrupting capacity of 100,000 rms symmetrical amperes at 480 volts. Base interrupting rating on the IEEE and NEMA Standard duty cycle for this class of equipment.
2. Provide circuit breakers trip units as follows:
  - a. Provide individual, thermal-magnetic trip units for all frame sizes smaller than 400 amperes.
  - b. Provide solid-state trip units for all frame sizes 400 amperes and larger.
  - c. Provide trip units that actuate a common tripping bar to open all poles when an overload or short circuit occurs on any one.
  - d. Provide trip elements with inverse time tripping and instantaneous tripping at about ten times the normal trip device rating.
  - e. Provide circuit breakers with trip-free handles.
  - f. All circuit breakers shall be fully rated and selectively tripped. No series rating applications will be accepted.
- J. Main and Tie Circuit Interrupters: Provide all main and tie circuit interrupters rated as shown, with equal construction to the circuit breaker that protects the feeder that supplies power to them and with the following additional features :
  1. Adjustable ground fault pickup and delay setting for breakers with trip ratings of 1,000 amperes or larger.
  2. Auxiliary normally open and normally closed contacts and tripped alarm contacts.
  3. Provide Kirk Key interlocks for the Main-Tie-Main circuit breakers to prevent more than two circuit breakers being closed at the same time.
- K. Surge Protective Devices (SPD)
  1. Provide SPDs equipment that complies with UL 1449 and UL 1283.
  2. Provide units with a maximum, continuous-operating voltage that exceeds 115 percent of the nominal system operating voltage.
  3. Provide SPD equipment suitable for wye configured systems.

4. Provide SPD equipment having directly connected suppression elements between line-line and (L-L), line-ground (L-G).
  5. Provide SPD equipment that distributes the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.
  6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise.
  7. Wire internal components with connections utilizing low impedance conductors and compression fittings.
  8. Provide a monitoring panel for each system that incorporates the following features:
    - a. Green/red solid state indicator light to indicate which phase(s) have been damaged.
    - b. A flashing trouble light to indicate fault detection
    - c. Transient event counter
    - d. Audible alarm
    - e. Form C dry contacts for remote indication of the unit status.
  9. Provide SPD suitable for service entrance or branch location application with a minimum total surge current capable of withstanding 250kA or 160kA per phase respectively or as shown.
  10. Locate the SPD, its monitor and feeds in a separate compartment from other MCC components
- L. Control Power Transformers: Provide individual control power transformers for each starter to derive the 120 volts for the unit's control circuit meeting the requirements of Section 16491 - Control Components and Devices. Ground the unfused leg of the secondary to the enclosure.
- M. Push Buttons, Selector Switches and Indicating Lights: Provide push buttons, selector switches and indicating lights including legend plates having the same type, appearance, shape and catalog number throughout each motor control center meeting the requirements of Section 16491 - Control Components and Devices.
- N. Control Components: Provide control components including elapsed time meters, control relays, latching relays, time delay relays, reset timers, repeat cycle timers, alternators meeting the requirements of Section 16491 - Control Components and Devices.



- O. Feeder Cable Terminals: Provide closed-end, compression-type, solderless connectors and terminals, suitable for copper conductors for terminating cables in accordance with Section 16491 - Control Components and Devices.
- P. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit. Schematic shall include all devices, internal and external to the unit, all required terminations for control and monitoring. Tag all terminals with number and description.
- Q. Identification: Provide nameplates having the same type, appearance and shape throughout each motor control center in accordance with the requirements of Section 16075 - Electrical Identification.

## 2.03 SOURCE QUALITY CONTROL

- A. Shop test each motor control center in accordance with IEEE and NEMA standards.
  - 1. Operational Tests: After the equipment has been completely assembled, perform operational tests to determine the general operating conditions and circuit continuity. Also, perform high potential tests and other standard tests for that particular class of equipment.
  - 2. Motor Control Centers shall be factory witness tested by representatives of the Contractor/Owner and may not be shipped to the job site before they are approved.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Adjustments: Set all motor circuit protectors and circuit breakers for the approved short circuit and coordination study. Set current switches per the recommendations of the motor supplier.
- C. Overloads: Adjust the thermal overloads on each phase of the starter units to the actual motor installed.
- D. Cable Connections: Terminate and label all field wiring per the approved diagrams.
- E. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

- F. Provide steel floor channels suitable for embedding in the concrete floor for leveling and anchoring the Motor Control Center. Contractor shall drill and tap the floor channels as required. Contractor to provide bolts, nuts and washers for anchoring the motor control center to the channel.
- G. Provide Seismic anchoring that complies with the manufacturers requirements and the project structural engineers approval.

### 3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Tests: Perform the following field tests:
  - 1. Close and open each circuit breaker and motor circuit protector to test operation.
  - 2. Energize the motor control center and test for hot spots.
  - 3. When site conditions permit, energize and de-energize each equipment item served by each motor control center, testing the complete control sequence of each item.

### 3.03 OPERATION DEMONSTRATION

- A. Manufacturer's Representative: Furnish the services of a qualified, factory-trained service engineer to assist in installation, start-up, field testing, calibration, placing into operation and provide training of each motor control center, as specified in Section 01821 – Training.
  - 1. Furnish the services of a service engineer when the equipment is placed into operation.
  - 2. Furnish the services of a service engineer at job site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.
  - 3. Training: Following completion of installation and field testing provide training for 12 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:
    - a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
    - b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.04 CLEANING AND PAINTING

- A. Shop Painting: Paint motor control centers in accordance with Section 09912 - Interior Painting.
- B. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

-END OF SECTION-

**Section 16460**  
**GENERAL PURPOSE DRY TYPE TRANSFORMERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for furnishing and installing ventilated, dry-type transformers.

**1.02 RELATED SPECIFICATIONS**

1. Section 09912 - Interior Painting
2. Section 16050 - Basic Electrical Materials and Methods

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
2. NEC - National Electrical Code
3. NYCBC - New York City Building Code
4. NEMA ST 20 - Dry Type Transformers for General Applications
5. EPA 2005 - Energy Policy Act 2005

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data including:
1. KVA ratings
  2. Service voltages
  3. Impedance and X/R ratio
  4. Number of phases
  5. Taps
  6. Insulation class
  7. Sound level
  8. Dimensions

9. Weights
10. Mounting details

C. Quality Control: Furnish the following as specified in Division 1.

1. Test Reports: Certified production reports for sound-level and temperature in accordance with NEMA ST 20
2. Manufacturer's Installation Instructions

D. Operations and Maintenance Manuals: Furnish manufacturer's operations and maintenance manuals as specified in Section 01831.

1.05 QUALITY ASSURANCE

- A. UL Label: Provide UL listing label or mark.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.
1. General Electric Company
  2. Cutler Hammer

2.02 MATERIALS

- A. General: Provide dry-type transformers suitable for indoor use.
- B. Insulation: Provide transformers above 15 KVA with 220-degree C temperature insulation materials. Provide transformers 15 KVA and below with a minimum of 185-degree C insulation materials.
- C. Flame Retardant Materials: Provide transformers with flame retardant materials that will not support combustion as defined in ASTM D 635.

2.03 FABRICATION

- A. Transformer Taps: Provide transformers rated over 15 KVA with at least two 2-1/2 percent full capacity taps above and below nominal in the primary winding. Provide transformers rated 15 KVA and below with two five percent taps or with four 2-1/2 percent taps below rated voltage on the primary winding.

- B. Windings: Provide separate primary and secondary windings fabricated from copper conductors. Autotransformer and "T" or Scott connected types are not acceptable.
- C. Voltage and KVA Ratings: Provide three-phase or single-phase transformers with primary and secondary voltages and kVA ratings as specified.
- D. Connections
  - 1. Three phase: Primary - 3-wire Delta; Secondary - 4-wire, solidly-grounded wye.
  - 2. Single Phase: Primary - 2-wire; Secondary - 3-wire with mid-point solidly-grounded.
- E. Continuous Operations: Provide transformers suitable for continuous operation at the rated KVA with a normal life expectancy as defined in NEMA ST 20 and the performance obtained without exceeding 115 degrees C average temperature rise by resistance or 145 degrees C hot spot temperature rise in 40-degree C maximum ambient and 30-degree C average ambient. Do not provide transformers that exceed 185-degree C maximum coil hot spot temperature.
- F. K-Factor: Provide three-phase transformers with a K-Factor not less than 13.
- G. Electrostatic Shields: Provide electrostatic shields between windings.
- H. Construction: Provide transformers with core mounting frames and enclosures of welded and bolted construction with sufficient mechanical rigidity and strength to withstand shipping, erection and short circuit stresses.
- I. Sound Levels: Transformers shall not exceed the following sound levels:

Transformer KVA	Average Sound Level in dB
	NEMA ST 20
0 - 09	40
10 - 50	45
51 - 150	50

- J. Lifting Lugs and Jacking Plates: Provide lifting lugs and jacking plates as required on the transformer.
- K. Provide copper lugs for all terminations.
- L. Connections to encapsulated transformers shall be made with 90 degree C insulated cable sized at the 75 degree C rating.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all transformers and provide guards as specified by the latest NYCBC, NEC and ANSI standards, and in accordance with manufacturer's instructions.
- B. Clearances: Provide clearance around the transformer meeting the manufacturer's recommendation.
- C. Supports: Provide suitable supports for all transformers. Mount transformers on one inch of Korfund, or equal sound-absorbent material.
- D. Primary Disconnect: Provide primary disconnect circuit breaker or disconnect switch as shown or required.

### 3.02 CLEANING AND PAINTING

- A. Shop Painting: Paint transformers meeting the requirements of Section 09912 - Interior Painting.
- B. Field Painting: Clean and touch up scratched and marred surfaces to match the original finish.

-END OF SECTION-

**Section 16471**  
**MINI-POWER CENTERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for providing mini-power centers consisting of a primary circuit breaker, dry-type transformer and secondary panelboard with main breaker.

**1.02 RELATED SPECIFICATIONS**

1. Section 09911 – Exterior Painting
2. Section 16050 - Basic Electrical Materials and Methods

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
2. NEC - National Electrical Code
3. NEMA ST 20 - Dry Type Transformers for General Applications

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.

- B. Product Data and Information: Furnish manufacturer's data including:

1. KVA ratings
2. Service voltages
3. Number of phases
4. Impedance
5. Taps
6. Insulation class
7. Sound level
8. Dimensions
9. Weights
10. Circuit breaker and panelboard ratings
11. Manufacturer's installation instructions
12. Mounting data



- C. Operations and Maintenance Manuals: Furnish manufacturer's operations and maintenance manuals as specified in Section 01831.

## 1.05 QUALITY ASSURANCE

- A. UL Label: Provide UL listing label or mark.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Cutler Hammer
2. Square D Company

### 2.02 MATERIALS

- A. General: Provide mini-power centers suitable for outdoor use in a marine environment.
- B. Insulation: Provide transformers with 180-degree C insulation system.
- C. Flame Retardant Materials: Provide transformers with flame retardant materials that will not support combustion as defined in ASTM D 635.

### 2.03 FABRICATION

- A. Transformer Taps: Provide transformers with two five percent taps below rated voltage on the primary winding.
- B. Windings: Provide primary and secondary windings fabricated from aluminum conductors completely encapsulated to provide a moisture-proof and shock-resistant seal.
- C. Voltage and KVA Ratings: Provide three-phase or single-phase mini-power centers with primary and secondary voltages and kVA ratings as shown.
- D. Connections
  1. Single Phase: Primary - 2-wire; Secondary - 3-wire with mid-point solidly-grounded.
- E. Continuous Operations: Provide transformers suitable for continuous operation at the rated kVA with a normal life expectancy as defined in NEMA ST 20 and the performance obtained without exceeding 185 degrees C temperature rise in 40-degree C maximum ambient and 30-degree C average ambient.

- F. Sound Levels: Transformers shall not exceed the following sound levels:

Transformer kVA	Average Sound Level in dB
	NEMA ST 20
0 - 09	40
10 - 30	45

- G. Main Circuit Breaker: Provide a main primary breaker with an interrupting rating of 14,000 rms symmetrical amperes at 277/480 volts.
- H. Secondary Panelboard: Provide a three-phase, four-wire or a single-phase, three-wire secondary panelboard with bolt on circuit breakers. Provide 20-ampere, single-pole, 120-volt circuit breakers, unless otherwise shown. Provide all breakers with quick-make, quick-break, toggle mechanisms with automatic thermal-magnetic, inverse time-limit overload and instantaneous short-circuit protection on all poles, unless otherwise indicated. Indicate automatic tripping by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Provide breaker handles that are trip-free on overloads. Provide circuit breakers having an interrupting rating of 10,000 rms symmetrical amperes at 240 volts.
- I. Enclosure: Provide a totally enclosed, nonventilated, NEMA 3R stainless-steel, with lifting eyes enclosure fabricated from heavy-gauge steel. Provide an enclosure that limits the maximum temperature within the enclosure to 90 degrees C.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install all transformers and provide guards as specified by the latest NEC and ANSI standards, and in accordance with manufacturer's instructions.
- B. Clearances: Provide clearance around the transformer meeting the manufacturer's recommendation.
- C. Directory: Furnish a laminated, typewritten directory with the following information:
1. Circuit number
  2. Area served
  3. Utilizing equipment

#### 3.02 CLEANING AND PAINTING

- A. Shop Painting: Paint the mini-power centers meeting the requirements of Section 09911 - Exterior Painting.

- B. Field Painting: Clean and touch up scratched and marred surfaces to match the original finish.

-END OF SECTION-

**Section 16491**  
**CONTROL COMPONENTS AND DEVICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for providing manual starters, motor controllers and remote control stations. In addition, the requirements for control components and devices for use in equipment provided under various other sections.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16055 - Electrical Requirements for Shop-Assembled Equipment
- B. Section 16060 - Grounding
- C. Section 16075 - Electrical Identification.
- D. Section 16085 - Basic Electrical Materials and Methods
- E. Section 16121 - Wires and Cables - 600 Volts and Below
- F. Section 16266 - Adjustable Frequency Drives
- G. Section 16445 - Motor Control Centers
- H. Section 16511 - Lighting

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies
  - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
  - 3. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors
  - 4. NYCBC - New York City Building Code

**1.04 SYSTEM DESCRIPTION**

- A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.
- B. Motor Controllers: Provide motor controllers suitable for 480-volt, three-phase, three-wire, 60-hertz operation.
- C. Control Devices: Provide control devices suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.

- D. Insulation Class: Provide control equipment and devices that meet the requirements of the 600-volt insulation class.

#### 1.05 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish catalog data for all associated equipment and devices.
- C. Shop Drawings: Furnish shop drawings customized to the project for manual starters, motor controllers and remote control stations that include the following:
  - 1. Outline drawings showing dimensions, identification of components and a nameplate schedule for all units.
  - 2. Bill of materials including manufacturers' name and catalog number.
  - 3. Individual schematic and wiring diagrams for each motor controller
- D. Equipment Ratings: Obtain and enter full performance details on all motors and other equipment being served on the above drawings.
- E. Furnish operation and maintenance instructions as specified in Section 01831.

#### 1.06 QUALITY ASSURANCE

- A. Codes: Provide manual starters, motor controllers and remote control stations that are in accordance with NEMA ICS 2.
  - 1. Provide manual starters, motor controllers and remote control stations that are in accordance with the NYCBC, NEC and local codes.
- B. UL Listing: Provide UL-listed manual starters, motor controllers and remote control stations.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle all products and materials as specified in Division 1.
- B. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

## 1.08 SPARE PARTS

## A. Furnish the following spare parts:

1. Two control stations of each type provided
2. One of each type of manual starter provided
3. One of each type of motor controllers provided
4. Provide 10 of each type relay and timer.
5. 10 of each rating current switch
6. 2 of each type alternator
7. 10 pushbuttons
8. 10 selector and lock-out switches.
9. 10 of each color indicating light
10. 2 each of every size control power transformer

## B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

## A. Acceptable manufacturers are listed below.

1. Manuel Starters, Motor Controllers and Remote Control Stations
  - a. Cutler-Hammer
  - b. General Electric Company
  - c. Or approved equal
2. Control Relays
  - a. Cutler-Hammer
  - b. Square D Company
  - c. Or approved equal
3. Timing Relays
  - a. Agastat 7000 Series
  - b. Eagle Signal
  - c. Or approved equal
4. Reset and Repeat Cycle Timers
  - a. Eagle Signal
  - b. Automatic Timing and Controls.
  - c. Or approved equal

## 5. Current Switches

- a. Cutler- Hammer ECS
- b. Hawkeye 708/908
- c. Or approved equal

## 6. Alternators

- a. Time Mark Corp. Model 261
- b. ABB SSAC Inc. Series ABP
- c. Or approved equal

## 2.02 MANUAL MOTOR STARTERS

- A. Provide toggle-type, thermal-switch, manual motor starters with pilot lights for all 120-volt, single-phase motors rated less than ½ hp.
- B. Where shown or required, provide starters complete with a HAND/OFF/AUTO selector switch.
- C. Provide starter enclosures as specified under the section Remote Control Stations.

## 2.03 MOTOR CONTROLLERS

- A. General: Provide 480-volt, 3-phase, 60-hertz, across-the-line, combination motor circuit protector magnetic starters with individual control power transformers.
- B. Magnetic Starters: Provide magnetic starters as follows:
  - 1. Full voltage nonreversing or full voltage reversing, as required.
  - 2. Starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide plated contact surfaces.
  - 3. Provide replaceable coils of the epoxy sealed type.
  - 4. Thermal Overload Elements: Class 20 thermal overload element and all required accessories. Provide size five and larger starters with current transformer operated overload relays.
    - a. Bimetallic type with an adjustment knob which allow plus or minus 15-percent adjustment of the heater's nominal rating.
    - b. Size the overload relays after approval of the corresponding motor.
    - c. Provide and adjust overload relays that match the associated motor nameplate running-current rating.

- d. Provide a set of isolated, normally-open and normally-closed contacts for each overload relay.
- 5. Provide seal in contacts for all controllers as needed.
- C. Motor Circuit Protectors: Provide a motor circuit protector for each combination starter as follows:
  - 1. Molded-case, air-break type designed for 600-volt, 60-hertz service with an interrupting capacity of 100,000 rms symmetrical amperes at 480 volts.
  - 2. Three-pole motor circuit protectors with magnetic, adjustable-trip units actuating a common tripping bar to open all poles when an overload or short circuit occurs.
  - 3. No thermal elements.
  - 4. Magnetic trip units capable of being set from 700 to 1,300 percent of the motor full-load amperes.
- D. Control Components: Provide push buttons, switches, indicating lights, transformers, relays and timers as specified under Section 16491 - Control Components and Devices.
- E. Enclosures: Provide motor controllers installed in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Outdoor and below grade elevation indoors	NEMA 4 – Watertight
Corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown	NEMA 4X - Watertight and corrosion-resistant stainless steel with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures
Above grade indoor	NEMA 12 – Industrial

## 2.04 REMOTE CONTROL STATIONS

- A. General: Provide heavy-duty, oiltight remote control stations, consisting of push buttons, indicating lights, and selector switches with double-break silver contacts meeting the requirements specified under the section Control Components.



- B. Enclosures: Provide motor controllers installed in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Outdoor and below grade elevation indoors	NEMA 4 – Watertight
Corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown	NEMA 4X - Watertight and corrosion-resistant stainless steel with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures
Above grade indoor	NEMA 12 – Industrial

- C. Lockout Attachments: Where shown, provide lockout attachments as follows:

1. Push buttons with padlockable attachment that holds the button depressed.
2. Selector switch with a padlockable attachment that covers the selector switch operators and allows the switch to be set in any position. Selector switch operators that use a removable key are not acceptable.

## 2.05 CONTROL COMPONENTS

- A. Push Buttons, Selector Switches and Indicating Lights

1. Provide heavy-duty, oiltight, 30.5 mm, push-button or selector-switch control stations arranged for flush-panel mounting.
2. Provide the additional switches, relays, and other electrical accessories necessary to control and safeguard the operation of the associated equipment.
3. Provide 30.5 mm, low-voltage, push-to-test, LED type indicating lights suitable for operation at 120-volt, 60-hertz ac control circuit voltages.
4. Color code indicating lights as follows:
 

Red	-	Motor running or valve open
Green	-	Motor off or valve closed
Amber	-	Capable of operation from this point
Blue	-	Alarm or trouble condition

- B. Control Power Transformer: Provide an individual, control power transformer for each starter to derive the 120 volts for the unit's control circuit. Provide transformers with sufficient capacity to meet the energy demands for all related control components including relays, solenoids and other indicated items. Provide

dual fuses on the primary and one fuse on the secondary. Ground the unfused leg of the secondary to the enclosure. All control power transformers shall be suitable for machine tool service.

- C. Elapsed Time Meters: Provide nonreset-type elapsed time meters to register up to 9999.9 hours, having square cases suitable for panel mounting and having coils for 120-volt, 60-hertz operation.
- D. Control and Latching Relays: Provide control and latching relays of 600-volt class, machine-tool quality with convertible contacts. Provide relay-operating contacts rated at a minimum of 10 amperes, 120 volts, 60 hertz.
- E. Timing Relays: Provide four-pole, double-throw, timing relays with timing ranges and ON/DELAY or OFF/DELAY operation as required. Provide contacts rated a minimum of 10 amperes at 120 volts, 60 hertz.
- F. Reset and Repeat Cycle Timers: Provide electromechanical or solid-state type reset and repeat cycle timers, with timing ranges and functions as indicated. Provide contacts rated at a minimum of 10 amperes, 120 volts, 60 hertz. Solid-state output contacts are not acceptable.
- G. Current Switches
  - 1. Provide current switches rated for operation on AC motor circuits. The device shall be self powered from the monitored line and the operating point shall be adjustable to adapt to different conditions.
  - 2. Switches shall open the contacts when the current falls below a level indicating that the motor is operating unloaded. Switch shall have 10amp 120 volt normally closed dry contacts.
- H. Alternators: Provide alternators suitable for 120-volt, 60-hertz operation.
  - 1. Provide alternator-operating double pole, double throw cross wired contacts rated at minimum of 7 amperes at 120 volts, 60 hertz.
  - 2. Provide alternators suitable for circuit design requiring alternating "lead-lag" operations.
  - 3. Provide alternators with integral three position switch "Load 1 – Alternate – Load 2" switch and LED status indicators.
  - 4. Provide 8-pin plug-in alternator with an 8-pin socket.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- B. Mounting: Mount manual starters, motor controllers and remote control stations 4 feet 6 inches from the finished floor up to their centerlines, unless otherwise shown. Mount all devices at least ½ inch away from concrete wall surfaces. Mount the current switches in an enclosure near the motor to be monitored. Extend wiring from the contacts back to the MCC for distribution.
- C. Adjustments: Set all motor circuit protectors and circuit breakers based on the approved short circuit and coordination study. Set the current switches per the recommendations of the motor supplier.
- D. Overloads: Adjust the thermal overloads on each phase of each starter unit for the actual motor installed.
- E. Cable Connections: Terminate and label all field wiring per the approved diagrams.
- F. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

### 3.02 FIELD QUALITY CONTROL

- A. Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

-END OF SECTION-

**Section 16511  
LIGHTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish and install all lighting fixtures, lamps and accessories required for a complete lighting system in accordance with the requirements specified under this section and as shown on the Contract Drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods
- B. Section 16491 - Control Components and Devices
- C. Section 16264 - Uninterruptible Power Systems

**1.03 REFERENCES**

- A. Lighting fixtures and devices shall comply with the latest applicable provisions and recommendations of the following:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code
  - 3. UL 924 - Emergency Lighting and Power Equipment
  - 4. UL 935 - Fluorescent Lamp Ballasts
  - 5. UL 1029 - High Intensity Discharge Lamp Ballasts
  - 6. UL 1570 - Fluorescent Lighting Fixtures
  - 7. UL 1571 - Incandescent Lighting Fixtures
  - 8. UL1572 - High Intensity Discharge Lighting Fixtures
  - 9. UL 1598A - Standard for Supplemental Requirements for Luminaires for Installation on Marine Vessels
  - 10. EPA - Energy Policy Act

**1.04 SUBMITTALS**

- A. Furnish all submittals, including the following, as specified in Section 01330 - Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.

B. Contractor shall submit the following:

1. Manufacturer's catalog data sheets indicating all technical information and construction details for each type of lighting fixture and control system component
2. Photometric data for each fixture type
3. Lamp type and technical information
4. Ballast type and technical information
5. Operations and maintenance manuals for lighting control system

1.05 QUALITY ASSURANCE

- A. Lighting fixtures shall be UL listed and approved for use in the City of New York. The lighting fixture types shall be in accordance with the fixture schedule as shown on the Contract Drawings. The descriptions and catalog numbers serve to establish the quality, appearance and performance of the specified lighting fixtures.
- B. All lighting fixtures shall be the products of lighting equipment manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified lighting fixtures.
- C. The Contractor shall be responsible for reviewing all drawings and coordinating with the rest of the Contract work for the installation of lighting fixtures and devices. The lighting fixture and devices shall be compatible with the wall and ceiling types.
- D. All industrial fixtures shall be of the highest quality material and construction for their respective types.
- E. Lamps for all lighting fixtures shall be in accordance with the Federal Energy Legislation for reduced energy consumption.
- F. Fixtures shall be suitable for connection to concealed or exposed conduit runs as required in each particular location and shall be of sizes suitable for lamp sizes indicated on the Contract Drawings.
- G. Fittings and other materials for special fixtures not definitely shown or specified shall be of approved material, make and quality and shall have a finish that will harmonize with other parts of the fixtures. Where suitable standard materials are not available such parts of the fixtures shall be specially manufactured.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Lighting fixtures and devices shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's instructions.

## 1.07 EXTENDED WARRANTY

- A. Manufacturers of lighting control system and emergency lighting power system shall provide an extended warranty for minimum of two years.

## 1.08 SPARE PARTS

- A. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.
- B. The following spare parts shall be furnished:
  - 1. 10 percent lamps shall be provided of each wattage of each type of HID lamp, but not less than 24.
  - 2. 5 percent ballasts shall be provided of each type of HID type ballast, but not less than 2.
  - 3. 10 percent lamps shall be provided of each wattage of each type of fluorescent lamps, but not less than 24.
  - 4. 5 percent ballasts shall be provided of each type of fluorescent type ballast, but not less than 2.
  - 5. 20 percent lamps shall be provided of each type of incandescent lamp, but not less than 24.
  - 6. Lens and Globes: Provide 10 percent, but not less than 6, of each type of lens or globes provided.
- C. Packaging: Deliver all spare parts neatly wrapped or boxed, indexed and tagged with complete information for use and reordering.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. General: The lighting fixture descriptions and catalog numbers listed in the Lighting Fixture Schedule are used to indicate the acceptable quality, design and distribution characteristics of approved lighting fixtures.

- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Lamps

- a. General Electric Company Lamp Division
- b. Philips Lighting Company
- c. Osram Sylvania

2. Ballasts

- a. Advance Transformer Company
- b. Universal Manufacturing Corporation
- c. Osram Sylvania
- d. General Electric

3. Emergency Power System for High Intensity Discharge and Incandescent Fixtures

- a. APC Power Clone
- b. Dual-Lite

2.02 LIGHT FIXTURES

- A. A lighting fixture shall be provided at each location indicated on the Contract Drawings. Light fixtures shall be provided in accordance with the lighting fixture schedule as shown on the Contract Drawings.
- B. Light fixtures shall be provided with all necessary hangers, supports, conduit adaptors, reducers, hooks, brackets and other support hardware. All hardware shall have a protective, non-corrosive finish.
- C. Recessed fixtures shall be provided with trim moldings and frames suitable for the types of ceilings.
- D. Pendant fixtures shall be suspended by means of an enclosed and gasketed cushion type hanger. The hanger shall be suitable to be mounted directly to the fixture outlet box and shall provide a minimum of 8 degrees swing from the vertical. Fixture stems shall be threaded rigid metal conduit, 3/4-inch minimum size. In corrosive areas as defined in Section 16050 - Basic Electrical Materials and Methods or as shown. Stems shall be PVC coated.
- E. Where fixtures are subjected to moisture, or assembled of dissimilar metals, gaskets of approved material and thickness shall be provided.

- F. Fixtures shall be completely wired except where they will be directly connected to branch circuit wiring. The conductors shall be not less than No. 12 gauge, stranded, with approved heat resistant covering.
- G. Mounting heights of all fixtures shall be as shown on the Contract Drawings. For special types, the height shall be determined at the time of installation.

## 2.03 LAMPS

- A. Lamps shall have voltage ratings suitable for the voltages shown on the Contract Drawings.
- B. Fluorescent lamps shall be cool white, energy efficient rapid start type. Unless specifically indicated otherwise, fluorescent lamps shall be 32 watt T8.
- C. Metal halide lamps shall be standard-line phosphor coated with wattage as indicated in the fixture schedule.

## 2.04 BALLASTS

### A. General

- 1. Ballasts shall be matched for proper operation of lamps and shall meet the requirements for fixture light output, reliable starting and operation.
- 2. Ballasts shall be UL listed and certified by Electrical Testing Laboratories and shall conform to certified ballast manufacturer's specifications.

### B. Fluorescent Ballasts

- 1. Fluorescent ballasts shall be high power factor, energy efficient type. Ballasts shall be Class P protected with a Class A sound rating. Ballast used with fixtures in unheated areas shall be cold weather type.
- 2. Ballasts for use with 32 watt T8 lamps shall be electronic type, with total harmonic distortion less than 10 percent total. The ballast factor shall be .85 or greater with total of less than 61 watts input.
- 3. Low temperature ballasts shall be provided where indicated on the fixture schedule.

### C. High Intensity Discharge Ballasts

- 1. Ballasts shall have a power factor of not less than 90 percent for 70 watt lamps and above.
- 2. Ballasts shall be pulse-start type where specified on the fixture schedule.



3. Ballasts shall be capable of starting lamps with a lamp wall temperature of 0 degrees C or lower.
4. Ballasts, including the starter aid, shall protect itself against normal lamp failure modes and shall be capable of operation with the lamp in an open or short circuit condition for six months without accelerated loss of ballast life.
5. Ballast primary current during starting shall not exceed normal operating current.
6. Ballasts shall be capable of sustaining lamp operation with a line voltage dip or sag of 50 percent for up to 4 seconds when operating a nominal voltage lamp, with nominal line voltage applied to the ballast primary, as defined in ANSI 82.6.
7. The line power factor of the lamp/ballast system shall not drop below 90 percent for plus or minus 10 percent line voltage variations at any lamp voltage, from nominal through rated end-of-life lamp voltage, as described in ANSI 82.6.

## 2.05 OUTDOOR LIGHTING

- A. General: Provide outdoor lighting luminaires and standards as listed in the Lighting Fixture Schedule.
- B. Mounting: Mount outdoor lighting on concrete bases or structures as shown.
- C. Wind Design: Provide outdoor lighting standards and luminaires that can withstand the force caused by a 100 mile-per-hour wind with a gust factor of 1.3.
- D. Lighting Standards: Provide lighting standards complete with mast arm subbase, anchor bolts and handholes.
- E. Receptacles: Provide receptacles in light standards where shown.

## 2.06 EMERGENCY LIGHTING POWER SYSTEM

- A. Emergency lighting power system shall be provided for operation of designated emergency HID lighting fixtures as indicated on the Contract Drawings. Capacity and number of output circuits shall be as shown on the Contract Drawings.
- B. Each system shall consist of an uninterruptible power supply and battery section complete with the manufacturer's standard monitoring and diagnostic functions housed in a vented free-standing enclosure. Each system shall be UL 924 listed.

- C. The inverter shall be electronic solid-state type suitable for operating HID lighting loads. The batteries shall be sealed, maintenance-free lead acid and shall include a battery charging system and transfer relay.
- D. Each system shall operate on 277V AC single-phase normal input power supplying both the circuits and the battery charger. If the normal power is lost, the inverter shall provide AC single-phase 277V AC emergency power to operate for up to 90 minutes the emergency lighting circuits.
- E. The system output shall automatically switch to battery power upon an outage of the normal input and when restored transfer back after time delay.
- F. Emergency Circuit Interface module shall be provided for installation in fixture junction box to allow normal lamp operating parameters to be maintained.

### PART 3 EXECUTION

#### 3.01 INSTALLATION OF LUMINAIRES

- A. Luminaires shall be installed at locations shown. Luminaires locations shall be adjusted where necessary to clear conflicts and obstructions. Luminaires recessed in suspended ceilings shall be located where indicated on the architectural reflected ceiling plan for that area.
- B. All luminaires shall be installed complete with all hardware, and supporting devices necessary to make a safe complete and fully operative installation. The Contractor shall obtain from the manufacturer for each lighting fixture, diagrams, illustrations and other installation instructions. The Contractor shall install in strict conformance with such instructions and the requirements of NYC Electrical Code.
- C. Recessed fluorescent fixtures shall be installed in suspended ceiling openings in conformance with manufacturer's recommendations and to suit the architectural details of the area involved. Independent supports from structural members of the building shall be provided. Unless otherwise shown, every fluorescent fixture shall have at least two supports.
- D. Pendant mounted fixtures shall be installed with 3/4-inch pendants.
- E. All pendant stem hangers shall be furnished with suitable aligner canopies or outlet box covers so that the lighting fixtures hang vertical to the finished floor irrespective of the angle of the surface from which they are suspended. When lighting fixtures or hanger canopies are mounted flush to the ceiling or wall, and where raceways and outlet boxes serving the lighting fixtures are surface mounted to the ceiling or wall, finishing rings shall be provided to conceal the outlet box. All visible hanging devices and appurtenances shall have the same finish as the lighting fixture.

- F. Reflectors, lenses, diffusers, louvers and decorative elements of lighting fixtures shall not be installed until completion of plastering, ceiling tile work, painting, and general clean-up in the area.
- G. Emergency Battery Packs (Lunch Buckets) shall be wired to the supply circuit ahead of any switching devices.

### 3.02 INSTALLATION OF DEVICES

- A. Emergency Lighting Power System
  - 1. Equipment shall be installed in accordance with manufacturer's instructions and recommendations.
  - 2. Equipment shall be installed at locations indicated on the Contract Drawings so that sufficient access and working space is provided for ready and safe operation and maintenance.
  - 3. Install system nameplates for identification of equipment.
  - 4. Battery Pack units shall not be wired to a switched leg of a power supply circuit.

### 3.03 FIELD TESTS

- A. After installation, the completed lighting system shall be field tested for operation and conformance. The field tests shall be witnessed by the Resident Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:
  - 1. Wiring continuity test shall be performed.
  - 2. Branch circuit load balance test shall be performed.
  - 3. Fixture and control operation test shall be performed.
  - 4. Emergency system operation and functionality test shall be performed.
- B. The Contractor shall provide a field test report. The report shall identify the test performed and the results obtained.

### 3.04 CLEANING OF LUMINAIRES

- A. Luminaires shall be cleaned inside and out to remove construction dust prior to substantial completion.
- B. Fixtures shall be re-lamped prior to substantial completion.

3.05 ADJUSTING

- A. Fixtures: Aim and adjust fixtures as shown
- B. Align adjacent fixtures horizontally and vertically
- C. Exit Sign Arrows: Adjust exit sign directional arrow as shown.
- D. Relamp fixtures that have failed lamps at substantial completion.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16723**  
**FIBER OPTIC CABLE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section describes the requirements for a fiber optic cable system as used by digital video, security and computer systems. This section includes fiber optic cable, connectors and all ancillary equipment necessary to provide fully functional systems.

**1.02 RELATED SPECIFICATIONS**

- A. Under the Structures and Equipment Contract
  - 1. Section 17250 - SCADA System - Facility Wide Network Equipment
- B. Under the Electrical Contract
  - 1. Section 16050 - Basic Electrical Materials and Methods
  - 2. Section 16075 - Electrical Identification
  - 3. Section 16121 - Wires and Cables - 600 Volts and Below
  - 4. Section 16130 - Electrical Raceway Systems
  - 5. Section 16752 - Digital Video System

**1.03 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods of the Electrical Contract.
- B. Product Data and Information: Furnish manufacturer's catalog data for each type of wire and cable furnished.
  - 1. A description of the network including:
    - a. Layout drawings showing all hardware and cabling
    - b. Catalog descriptions for each component

**1.04 MAINTENANCE**

- A. Spare parts shall be furnished and shall be completely identified with a numerical system to facilitate parts inventory, control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size unit shall have the same part number. The following shall be supplied:

1. One set of all special tools, wrenches and test equipment required to disassemble, test, repair and adjust the equipment shall be provided.
2. One set of fiber optic test tools shall be furnished. The test set shall consist of Optical Light Source (OLS) MicroTest Optical Light, Tektronics TOP 130 LED light source or equal, Optical Power Meter (OPM), MicroTest Fiber eye, Tektronics TOP 200 or equal, TOP visual Fault Finder or equal.
  - a. Optical Power Meter (OPM)
    - (1) Accuracy/Linearity +/-0.2dB
    - (2) Amplifier design: Linear
    - (3) Calibrated wavelength: 850nm, 1300nm
    - (4) Calibration period: 12 months
    - (5) Display resolution: 0.01dB
    - (6) Dynamic range (Power): +3dB to -55dB
    - (7) Optical adapter: Universal
    - (8) Photodiode: Germanium
    - (9) Power Source: 2 AA batteries
    - (10) Battery Life: 100 hours
  - b. Optical Light Source
    - (1) Source type: LED
    - (2) Wavelength: 850nm, 1300nm
    - (3) Power launched into 62.5/125nm fiber @850nm: -13dBm and @1300nm: -12dBm
    - (4) Power output accuracy: +/-2dB @ 850nm and +0.5dB @ 1300nm
    - (5) Optical adapter: Universal
    - (6) Power Source: 2AA batteries
    - (7) Battery life: 8 hours
3. Splice/connectorization kit: Provide a splice and termination kit with the following minimum equipment.
  - a. Fiber cleaver - Corning Cable Systems model FBC-005 or approved equal
  - b. 50 multimode connectors of each type used. Connectors shall be of the mechanical type with a pre-polished factory stub with mechanical splice with index matching gel. Connectors shall be Corning Cable Systems Unicam multimode connectors or approved equal.
4. Additional items as recommended by equipment manufacturers or as described elsewhere in the Specifications.

5. Twenty patch cables of each type provided.
- B. Provide special tools necessary for normal operation, maintenance and diagnostic aids.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  1. Fiber Optic Cables
    - a. Optical Cable Corporation, DX series
    - b. Belden, Tray optics series
    - c. Phoenix Digital FOC - ECP series
    - d. Or approved equal
  2. Fiber Optic Patch Cables
    - a. Optical Cable Corporation
    - b. Siecor
    - c. Or approved equal

### 2.02 MATERIALS

#### A. General

1. Provide all necessary items for installation, including mounting brackets, interconnecting cables, hardware and appurtenances.
2. Fiber optic cable shall be utilized for CCTV and instrumentation circuits as specified in Section 16752 - Digital Video System of the Electrical Contract and instrumentation circuits as specified in Section 17250 - SCADA System - Facility Wide Network Equipment of the Structures and Equipment Contract.

#### B. Fiber Optic Cable

1. Fiber optic cable shall be installed for inter-building and inter-panel communication and digital video systems as shown.
  - a. Inter-Building And Inter-Panel Communication: The fiber optic cable for inter-building and inter-panel communication shall meet the following:



- (1) Cable shall be suitable for installation as both trunk cable and riser cable.
  - (2) Cable shall be rated for indoor/outdoor use.
  - (3) Cable shall be 62.5/125 micrometer (core/clad) multimode fiber optic cable.
  - (4) Cable shall utilize a multifiber per tube (MFPT) design consisting of 12 fibers contained in tight buffer tubes.
  - (5) Cable shall utilize a 900 um diameter tight buffer coating on each optical fiber.
  - (6) Cable shall be riser rated distribution cable.
  - (7) Cable shall have a ripcord(s) to assist in jacket removal.
  - (8) Cable shall be suitable for direct termination with standard connectors.
- b. Digital Video System: The fiber optic cable for digital video system shall meet the following:
- (1) Cable shall be suitable for installation as both trunk cable and riser cable.
  - (2) Cable shall be rated for indoor/outdoor use.
  - (3) Cable shall be 62.5/125 micrometer (core/clad) multimode fiber optic cable.
  - (4) Cable shall utilize a multifiber per tube (MFPT) design consisting of 4 fibers contained in tight buffer tubes.
  - (5) Maximum Attenuation: 3.50 dB/km at 850 nm; 1.0 dB/km at 1300 nm.
  - (6) Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
  - (7) Cable shall utilize a 900 um diameter tight buffer coating on each optical fiber.
  - (8) Cable shall be riser rated distribution cable.
  - (9) Cable shall have a ripcord(s) to assist in jacket removal.

(10) Cable shall be suitable for direct termination with standard connectors.

2. Fiber Optic Patch Cables

- a. Patch cables shall be 62.5/125 micrometer (core/clad) multimode fiber optic cable.
- b. Patch cables shall be terminated with connectors as scheduled.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

- 1. Install all fiber optic cable in accordance with the manufacturer's recommendations.
- 2. Provide pull boxes as needed to safely pull cable without damage.
- 3. Terminate both ends of all cables in a separate fiber optic patch panel, unless otherwise shown in a common patch panel.
- 4. Provide fiber optic jumper cables to interconnect between patch panels.
- 5. Provide support for all riser cables to reduce tensile load below eighty percent of the manufacturer's maximum long term tensile load requirements.
- 6. Inspect all fiber optic cables before and after installation.
- 7. Faulty fiber optic cables shall be removed and replaced at no additional cost to the City of New York.
- 8. Provide long radius elbows which are in excess of the manufacturer's advertised long-term minimum bending radius.
- 9. Where two cables join, provide two patch panels mounted adjacent to each other with necessary jumpers between panels provided.
- 10. Terminate all fibers in every cable with extras tagged as spare.

3.02 FIELD TESTING

- A. Provide the services of the fiber optic cable manufacturer to inspect the installation of each cable. Test each fiber between its patch panel bulkhead connectors for

optical power loss and frequency response. All fibers shall be verified to meet manufacturer's advertised specifications.

-END OF SECTION-

**Section 16724**  
**FIBER OPTIC PATCH PANELS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish all labor, materials, equipment and incidentals required to install, and place into successful operation, fiber optic patch panels as used by the telephone, security access and control, CCTV and process monitoring and control systems. This section includes all ancillary equipment necessary to provide a fully functional patch panel system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods
- B. Section 16075- Electrical Identification
- C. Section 16752 - Digital Video System
- D. Section 17250 - SCADA System - Plant Wide Network Equipment

**1.03 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish Manufacturer's product data sheets and complete construction details including physical characteristics of each patch panel.
  - 1. Overall dimension of each patch panel.
  - 2. A description of the network including:
    - a. Layout drawings showing all cabling and connections.
    - b. Catalog descriptions of each component.

**1.04 SPECIAL TOOLS**

- A. The Contractor shall provide special tools necessary for normal operation, maintenance and diagnostic aids.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Fiber Optic Patch Panels
  - a. Net Optics
  - b. Corning Cable Corp.

### 2.02 MATERIALS AND COMPONENTS

- A. General: Provide all necessary items for installation including, but not limited to, mounting brackets, interconnecting cables, hardware and appurtenances.

- B. Fiber Optic Patch Panels:

1. Wall mounted fiber optic patch panels meeting the following minimum specifications shall be installed as shown.
  - a. Capacity for 24 connectors and jumpers.
  - b. Thin modular low profile splice tray shall accommodate splicing for fusion and mechanical splices.
  - c. Dual doors shall be provided to separate the cable entry section and the patch panel side.
  - d. Provide cable routing from the top and bottom of both panel sections.
  - e. Enclosures shall be manufactured from 16-gauge, cold rolled steel.
  - f. Panels shall be provided with grounding and strain relief lugs to support the fiber cable.
  - g. Provide cable tie-down support islands to take up excess fiber optic cable and insure it does not exceed its maximum bending radius.
  - h. Provide cable bulkhead adapters pre-mounted on eight plates, six connectors per plate (dual fiber connectors count as two).
  - i. Panels shall be inspected to assure that there are no sharp edges which could damage the fiber optic cable.

- j. Patch panel dimensions shall be a minimum of 13.5" high x 22.5" wide x 4" deep.
  - k. Patch panel shall be mounted in a painted steel NEMA 12 enclosure.
2. Rack-mounted fiber optic patch panels meeting the following minimum specifications shall be installed in the CCTV and security compartments of the console and in the network interface panel as shown.
- a. Capacity for 24 connectors and jumpers.
  - b. Provide universal mounting brackets for 19 and 23 inch EIA relay racks and cabinets.
  - c. Modular low profile splice tray shall accommodate splicing for fusion and mechanical splices.
  - d. Provide access from the front, rear, left and right sides.
  - e. Panels shall be manufactured from 16-gauge, cold rolled steel.
  - f. Panels shall be provided with grounding and strain relief lugs to support the fiber cable.
  - g. Provide cable tie-down support islands to take up excess fiber optic cable and insure it does not exceed its maximum bending radius.
  - h. Panels shall be inspected to assure that there are no sharp edges which could damage the fiber optic cable.

### PART 3 EXECUTION

#### 3.01 FIBER OPTIC PATCH PANELS

- A. Install fiber optic patch panels, with enclosure, on wall or in 19" rack as shown and in accordance with manufacturer's guidelines.
- B. Where two fiber optic cables join provide two patch panels mounted adjacent to each other with necessary jumpers provided between panels.
- C. Terminate all fibers in every cable with extras tagged as spare.
- D. Label each patch panel and include a termination list attached to the inside of the door.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16741**  
**PAGING SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish a complete paging/intercom system. The system shall include all necessary handset/amplifier control stations, special mounting boxes, loudspeakers, terminal boards, cable, connectors and accessories for a complete operational voice communication system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01821 – Training
- B. Section 16050 - Basic Electrical Materials and Methods
- C. Section 16121 - Wires and Cables - 600 Volts and Below
- D. Section 16130 - Electrical Raceway Systems

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEC - National Electrical Code
  - 2. NYCBC - New York City Building Code

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Manufacturer's catalog data sheets indicating all electrical characteristics.
- C. Manufacturer's instruction manual.

**1.05 SYSTEM DESCRIPTION**

- A. General: The system shall provide voice paging and communication throughout the facility, including areas of extreme high ambient noise levels. The system shall allow amplified calling of personnel over the loudspeakers and two-way communication over one of five available party line channels.
- B. Page channel shall broadcast speech over all system speakers. Where necessary, to prevent acoustic coupling, the speaker connected to the hand set station shall be automatically muted when handset is removed from its cradle and page channel is selected.



- C. Party line channel shall provide two-way conversation capability without interference of cross talk between channels. Conversation will not be heard over the speaker system.

#### 1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three (3) years documented experience.

#### 1.07 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by UL or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- B. Conform to requirements of FCC.

#### 1.08 WARRANTY

- A. Furnish a written 2-year minimum warranty for parts and labor from the paging system manufacturer.

#### 1.09 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. One of each type of desk top paging station.
  - 2. Twenty percent but not less than four, of each type of wall mounted paging station.
  - 3. Twenty percent but not less than two, of each type of speaker amplifier
  - 4. Twenty percent but not less than four, of each type of wall mounted indoor speaker.
  - 5. Twenty percent but not less than four, of each type of weatherproof bullhorn speakers
- B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for approval.

1. ComTrol International
2. Gai-Tronics Corporation

## 2.02 DESK TOP PAGING STATION

- A. Provide desk top paging speakers that meet the following requirements:

1. Output level: 1.5volts into 33 ohm load
2. Distortion: less than 1/5%@1000Hz
3. Isolation: Output transformer
4. Output protection: Short circuit-proof
5. Controls: Amplifier Board located on PC board
6. Five Party Lines

## 2.03 WALL-MOUNTED PAGING STATION

- A. Provide wall mounted paging speakers that meet the following requirements:

1. Output level: 1.5volts into 33 ohm load
2. Distortion: less than 1/5%@1000Hz
3. Isolation: Output transformer
4. Output protection: Short circuit-proof
5. Adjustments: Side tone adjustments located on pc board. Handset amplifier pot located on PC board
6. Controls: Magnetic off-hook switch with sealed relay. Handset paging with sealed relay.
7. Five Party Lines
8. Connections: Terminal block located in back of housing
9. Housing: Type 304 stainless steel, moisture, corrosion, and vibration resistant housing with gray epoxy powder coat finish.

10. Heavy Duty Handset Cord
11. Noise Canceling Microphone

#### 2.04 SPEAKER AMPLIFIER

- A. Provide speaker amplifier that meet the following requirements:
1. Power output: 20 watts RMS to 8 ohms or 12 watts to 16 ohms
  2. Frequency response: 250 to 4000Hz +/-1.5 dB
  3. Distortion: 1% maximum @ 20 watts and 1000 Hz
  4. Hum and Noise: At least 50 dB below rated output
  5. Isolation: Input transformer on power, page, and party lines
  6. Input Sensitivity: Less than one volt for rated output
  7. Input Impedance: Greater than 50000 ohms
  8. Output protection: Instantaneous short circuit and impedance protection
  9. Adjustments: Speaker volume control located on PC board, accessible through front panel.
  10. Housing: Type 304 stainless steel, moisture, corrosion, and vibration resistant housing with gray epoxy powder coat finish.

#### 2.05 WALL-MOUNTED INDOOR SPEAKER

- A. Provide wall-mounted indoor speakers that meet the following requirements:
1. Single cone: 8-inch
  2. Frequency response: 100-8000 Hz (+/- 6 dB)
  3. Dispersion angle: 50 degrees at 4000 Hz -6 dB
  4. Sensitivity: 95 dB SPL, 1 watt/1meter
  5. Nominal free air resonance: 90 Hz
  6. Impedance: 8 ohms
  7. Power handling: 30 watts continuous
  8. Volume Control

## 2.06 WEATHERPROOF BULLHORN SPEAKER

- A. Provide weatherproof bullhorn speakers that meet the following requirements:
1. Power rating: 30 watt continuous
  2. Frequency response: 300-12000 Hz (nominal) ; 500-4500 Hz (+/- 5 dB)
  3. Sensitivity: 126 dB @30 watts (peak); 121dB @30 watts/ 1 meter 500-4500 Hz; 108 dB @1watt 1meter 500-4500 Hz
  4. Dispersion angle: 60° (-6 dB, 20000 octave band)
  5. Material: Spun aluminum with epoxy coating.

## 2.07 CONDUIT AND CABLES

- A. Conduit and boxes: Provide conduit and boxes that meet the requirements of Section 16130 - Electrical Raceway Systems.
- B. Cable: Provide cables meeting the requirements of Section 16121 - Wire and Cable - 600 Volts and Below.

## PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Install paging system as shown or required. Comply with requirements of the NYCBC, NEC and local electrical codes.

## 3.02 FIELD SERVICES

- A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the paging system manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01821 – Training. Provide all instruments and equipment necessary to conduct required tests, adjustments and training. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.
- B. Training: Following completion of installation and field testing provide training for 12 employees of the City of New York in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the DSNY's facilities at a time agreeable to the City of New York:

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

-END OF SECTION-

**Section 16742**  
**RADIO COMMUNICATIONS SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish a radio communications system complete with desktop mobile radio station, two-way mobile radios, desktop chargers, and all required accessories.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods

**1.03 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Manufacturer's catalog data sheets indicating all electrical characteristics.
- C. Manufacturer's instruction manual.
- D. Submit completed FCC license permit application(s) for review prior to submitting them to the FCC.

**1.04 SYSTEM DESCRIPTION**

- A. General: The system shall be a multiple channel two-way mobile radio system to permit communications between equipment operators throughout the facility, including gantry crane operators, lidding equipment operators, excavators, loaders, tipping level traffic managers, and dock traffic managers and between central desktop stations in the Foreman's Office and Operations Room and the equipment operators. Populate each radio with all frequency so that all four channels are active.
- B. Schedule of Equipment: Provide the radio communication equipment as follows:
  - 1. One desktop mobile radio station in the Foreman's Office
  - 2. One desktop mobile radio station in the Operations Room
  - 3. Sixty hand-held portable two-way radios
  - 4. Ten multiple-unit battery chargers
- C. Desktop Mobile Radio Station Antenna: Provide an antenna for each desktop mobile radio station that allows the radio communication system to operate throughout the transfer station with coverage extending 100 feet beyond the building.

## 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.

## 1.06 QUALITY CONTROL

- A. Provide the services of the radio communications manufacturer to design and guarantee the radio communications system to meet the specified requirements.

## 1.07 REGULATORY REQUIREMENTS

- A. Furnish Products listed and classified by UL or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- B. Conform to requirements of FCC.
- C. Radio License: Complete and submit permit application(s) with the FCC for radio license(s) for the transfer station. If possible, utilize the same frequencies as other City of New York transfer stations.

## 1.08 WARRANTY

- A. Furnish a written 2-year minimum warranty for parts and labor from the radio communications system manufacturer. Furnish a written 1-year minimum replacement warranty for accessories.

## 1.09 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. Twenty 1800mAh Li-ion batteries
  - 2. One hundred headsets
  - 3. Ten hand-held portable two-way radios
  - 4. Two multiple-unit battery chargers
- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Motorola

## 2.02 HAND-HELD PORTABLE TWO-WAY RADIOS

- A. Provide hand-held portable radios that meet the following requirements:

1. Channel Capacity: 4-channel operation with rotary channel selector.
2. Battery: High Capacity 1800mAH Li-ion rechargeable battery, 14 hours average life
3. UHF Transmitter
  - a. RF Output: High, 4 Watts
  - b. Frequency: 438-470 M Hertz
  - c. Channel Spacing: 12.5/20/25 kHz
  - d. Frequency Stability: 0.00025%
  - e. Audio Distortion at 1000 Hertz: less than 3%
4. UHF Receiver
  - a. Frequency: 438-470 M Hertz
  - b. Band: 20/25/30 kHz
  - c. Sensitivity at 12 dB: 0.25 uV
  - d. Adjacent Channel Selectivity: -70dB
  - e. Intermodulation: -70dB
  - f. Frequency Stability: 0.00025%
  - g. Audio Output: at less than 5% Distortion: 500 mW to penetrate noisy environment
5. Whip Antenna



6. Housing: Rugged die-cast chassis with polycarbonate housing designed to withstand harsh environment, including exposure to salt fog, blowing rain, blowing dust, vibration, shock, and outdoor temperatures.
7. Push-to-Talk Button
8. Spring Action Belt Clip
9. Tri-Color LED to indicate radio status and battery level
10. Rotary On/Off and Volume Control
11. Headset with microphone for each radio to allow hands-free operation as specified below
12. Motorola Model CP200 or approved equal

## 2.03 DESKTOP MOBILE RADIO STATION

### A. Provide desktop mobile radio station that meet the following requirements:

1. Channel Capacity: 64 UHF channels
2. RF Outout: 1-25W
3. UHF Transmitter
  - a. RF Output: High, 4 Watts
  - b. Frequency: 403-470 M Hertz
  - c. Channel Spacing: 12.5/20/25 kHertz
  - d. Frequency Stability: 0.00025%
  - e. Audio Distortion: less than 3%
4. UHF Receiver
  - a. Frequency: 403-470 M Hertz
  - b. Channel Spacing: 12.5/25/25 k Hertz switchable
  - c. Sensitivity at 12 dB: 0.23 uV typical
  - d. Adjacent Channel Selectivity: -75dB at 25 kHertz
  - e. Intermodulation: -75 dB
  - f. Audio Output with 4 ohm speaker: 13 Watts external
  - g. Audio Distortion: 3%
5. Microphone and Tray
6. Front Projecting Speaker

7. 14 Character Alpha-Numeric Display
8. Radio Signal Strength Indicator
9. Caller ID
10. LED Indicators
11. Antenna as required to provide the specified coverage.
12. Housing: polycarbonate housing designed for -30 degrees C to +60 degrees C operating temperature and 95% relative humidity
13. Motorola Model CDM1250 or approved equal

#### 2.04 MULTIPLE-UNIT BATTERY CHARGERS

- A. Provide rapid rate multiple-unit battery chargers capable of charging up to 6 batteries and/or hand-held portable two-way radios simultaneously.
- B. Motorola Model WPLN4161AR or approved equal

#### 2.05 HEADSETS

- A. Provide heavy duty headsets that meet the following requirements:
  1. Behind- the-head style and capable of being worn with hard hats
  2. 24dB noise reduction
  3. Noise canceling boom microphone
  4. Push-to-talk switch on ear cup
  5. VOX module
  6. Motorola Model BDN6648C or approved equal

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install radio communications system as shown or required. Comply with requirements of the NYCBC, NEC and local electrical codes.

#### 3.02 FIELD SERVICES

- A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the paging system manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01821 – Training. Provide all instruments and equipment necessary to conduct required tests, adjustments and

training. Have the manufacturer's representative utilize prepared comprehensive check sheets covering inspections, checks and tests required for the assembly of the switchgear. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

- B. Training: Following completion of installation and field testing provide training for 12 employees of the City of New York in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the DSNY's facilities at a time agreeable to the City of New York:
  - 1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  - 2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
- C. Demonstration that the system performs according to specified requirements and permits communications without interference between equipment operators throughout the facility, including gantry crane operators, lidding equipment operators, excavators, loaders, tipping level traffic managers, and dock traffic managers and between central desktop stations in the Foreman's Office and Operations Room and the equipment operators.

-END OF SECTION-

**Section 16745**  
**TELEPHONE SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnish and install telecommunications system components including main and local distribution racks, voice/data outlets, telecommunication cables, and raceway system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 16050 - Basic Electrical Materials and Methods  
B. Section 16121 - Wires and Cables - 600 Volts and Below  
C. Section 16130 - Electrical Raceway Systems  
D. Section 16264 - Uninterruptible Power Supplies

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:

1. NFPA 70 - National Electrical Code
2. NYCBC - New York City Building Code
3. UL 467 - Standard for Grounding and Bonding Equipment
4. UL 1449 - Standard for Transient Voltage Surge Suppressors
5. TIA/EIA 310 - Cabinets, Racks, Panels, And Associated Equipment
6. TIA/EIA 492 - Specification for Optical Waveguide Fibers
7. TIA/EIA 568 - Commercial Building Telecommunications Cabling Standard.
8. TIA/EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
9. TIA/EIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.
10. IEEE 802.3 - Telecommunication and Information Exchange Between

**1.04 DEFINITIONS**

- A. Abbreviations

1. FDDI: Fiber distributed data interface
2. FOCS: Fiber Optic Communication Subsystem
3. HMI Integrator: Subcontractor to Construction Manager
4. LAN: Local area network
5. Hz: Megahertz
6. Mbps: Megabits per second

7. OTDR: Optical time-domain reflectometer
8. PICS: Process Instrumentation and Control System.
9. IC System Integrator: Subcontractor to General Contractor.
10. UPS: Uninterruptible power supply.
11. WAN: Wide area network.

#### 1.05 SYSTEM DESCRIPTION

- A. The systems shall supply voice and data communications networks through-out the building using equipment rooms, terminal boards, routers, component rack system, network switches, network servers, fiber optic cables, twisted pair cables, patch panels, converters, connectors, raceways and devices.
- B. Telephone system shall connect the Utility supply and switching equipment to distribution lines connecting outlets for instruments, where indicated, through-out the building. Direct outside line connections shall be provided for designated personnel and equipment where indicated.
- C. The telephone Utility shall be supported with a UPS.
- D. The data system shall connect the Utility supply and switching equipment to distribution lines connecting outlets for PC's and equipment, where indicated, through-out the building

#### 1.06 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Submit manufacturer catalog data sheets indicating technical data for the following:
  1. Telecommunication Mounting Elements
  2. Voice/Data Outlets
  3. Telephone Terminal Cabinets
  4. Terminal Strips and Blocks
  5. Routers
  6. Equipment Racks
  7. Network Components
  8. Patch Panels
  9. Equipment Rack and Network Interface Panels
  10. Fiber Optic Cable and Accessories
  11. Software

- C. Shop Drawings: Furnish shop drawings for the telephone and data systems including the following:
  - 1. Furnish a layout of the system indicating all equipment, devices and wiring including equipment mounting heights and details.
  - 2. Furnish wiring diagrams for any assemblies that show connections to electrical power or communications distribution or equipment.
  - 3. Cable schedule showing:
    - a. Cable identification
    - b. Fiber counts for each cable and identification of used fiber pairs
    - c. Cable length and attenuation, with two connector pairs and no splices, based on TIA/EIA 568, Annex H
  - 4. Point-to-point fiber diagrams, including fiber terminations and patch cords. All fiber cables and fiber pairs shall be identified.
  - 5. Component Data
    - a. Manufacturer and model number
    - b. General data and description
    - c. Engineering specifications and data sheet
    - d. Scaled drawings and mounting arrangements
- D. Informational Submittals
  - 1. Manufacturer's statement that installer is certified to perform installation Work.
  - 2. Subcontractor Qualifications:
    - a. FOCS Subcontractor: Minimum of three (3) years experience providing, integrating, installing, and commissioning of similar systems.
    - b. City acceptance of FOCS Subcontractor does not exempt FOCS Subcontractor or Contractor from meeting Contract Document requirements nor does it give prior acceptance of subsystems, equipment, materials, or services.
- E. Quality Control: Provide test reports and certifications for all cable and equipment furnished.

- F. Provide operations and maintenance manuals for any equipment.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling installer must have on staff personnel certified by Building Industry Consulting Service International (BICSI).
  - 1. Installation shall be under the direct supervision of a registered technician who shall be present at all times when Work of this Section is performed at Project site.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
  - 1. Testing Agency's Field Supervisor: Person currently certified by BICSI as a registered communication distribution designer to supervise field quality-control testing.
- C. Source Limitations: Obtain all products except cables through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NFPA 70, "National Electrical Code."
- F. Contact Verizon service representative for specific instructions regarding telephone service requirements at each facility before commencing work.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Optical Fiber Cable
  - 1. Outside, Underground/Submerged: Minus 20 to 40 degrees C
  - 2. Outside, Aboveground in Conduit: Minus 40 to 80 degrees C
  - 3. Inside: 0 to 40 degrees C
- B. Equipment
  - 1. Outside, Aboveground: Minus 40 to 80 degrees C
- C. Control Rooms, Equipment Rooms and Telecommunications Closets: 30 to 55 percent relative humidity, 18 to 24 degrees C.
- D. Other Interior Areas: 0 to 100 percent relative humidity, 5 to 35 degrees C.

1.09 WARRANTY

- A. Furnish a written 2-year minimum warranty for parts and labor from the telephone system manufacturer. Furnish a written 1-year minimum replacement warranty for accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below.

- 1. Cabinets

- a. Hoffman
- b. Saginaw
- c. Hammand
- d. Or approved equal

- 2. Telecommunication Mounting Elements

- a. Ortronics
- b. CommScope
- c. Belden
- d. Or approved equal

- 3. Network Components

- a. Hirschmann
- b. Allied Telesis
- c. Cisco
- d. Or approved equal

- 4. Patch Panels

- a. Ortronics
- b. CommScope
- c. Belden
- d. Or approved equal

- 5. Equipment Rack and Network Interface Panel Accessories

- a. Ortronics
- b. CommScope
- c. Belden
- d. Or approved equal



## 6. Personnel Area Server Room Equipment Racks

- a. Ortronics
- b. CommScope
- c. Belden
- d. Or approved equal

## 7. Network Interface Panels

- a. Ortronics
- b. CommScope
- c. Belden
- d. Or approved equal

## 2.02 TELECOMMUNICATION MOUNTING ELEMENTS

- A. Backboards: Minimum of 48 inches by 48 inches by 3/4-inch, interior-grade, fire-retardant-treated plywood. Equip the backboard with all related materials for terminating and cross connecting the voice communication cables. Provide one terminal for each conductor plus minimum of 20% spare terminals.
- B. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
  - 1. Module Dimension: Width compatible with EIA 310 standard 19-inch (480-mm) panel mounting
  - 2. Finish: Baked-polyester powder coat
  - 3. Power Strips: For mounting in the rack, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles, no fewer than 6, and including the following:
    - a. LED indicator lights for power and protection status
    - b. LED indicator lights for reverse polarity and open outlet ground
    - c. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
    - d. Close-coupled, direct plug-in line cord
    - e. Rocker-type on-off switch, illuminated when in on position
    - f. Peak Single-Impulse Surge Current Rating: 26 kA per phase

- g. Protection modes shall be line-to-neutral, line-to-ground, and neutral-to-ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.
    - h. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and No. 4.
  - 4. Telephone Terminal Cabinets: Provide cabinets with terminal boards suitable to terminate 50 pair station cables distributing between telecommunication and data rooms and hard wire emergency and notification circuits. Cabinets shall be made from galvanized steel with door and back panel. Construct panel to NEMA 1B rating and finish in grey corrosion resistant finish. Provide 25% spare terminals. Box to be Hoffman or approved equal.
  - 5. Wall-Mounting Rack: Aluminum, hinged wall bracket with provisions for power strip mounting.
  - 6. Floor-Mounting Rack: Steel, freestanding, modular, with vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
  - 7. Provide system of capacity sufficient for the proposed 2 T-1 system head end and local distribution equipment and as recommended by the telephone and data service provider. Rack-Mounted UPS: In accordance with Section 16264.
- 2.03 UNINTERRUPTIBLE POWER SUPPLIES.
  - A. Provide Uninterruptible Power Supplies in accordance with Division 16 Section "Uninterruptible Power Supply Systems."
- 2.04 NETWORK COMPONENTS
  - A. Gigabit Network Switch
    - 1. Full compliance with IEEE 802.3.
    - 2. Supports 10 Mbit/s Ethernet, 100 Mbit/s Fast Ethernet, and 1,000 Mbit/s Gigabit Ethernet.
    - 3. DIN-rail mounted switch operating on 120V ac power.
    - 4. Chassis provided with sufficient media modules to support all required connections. Media modules shall include a minimum of twelve 10/100 Mbit/s twisted pair ports and two 1,000 Mbit/s (Gigabit) single-mode fiber "Small Form Factor Pluggable" (SFP) ports.

5. Operating Temperature: 0 to 60 degrees C.
  6. Manufacturer and Product: Hirschmann; MS-30 plus specified media modules or approved equal.
- B. Fast Ethernet Network Switch (sub-ring switches):
1. Full compliance with IEEE 802.3.
  2. Supports 10 Mbit/s Ethernet, 100 Mbit/s Fast Ethernet.
  3. DIN-rail mounted switch operating on 120V ac power.
  4. Chassis provided with a minimum of six 10/100 Mbit/s twisted pair ports and two 100 Mbit/s single-mode fiber pair ports. Sufficient ports shall be provided to support all required connections.
  5. Operating Temperature: 0 to 60 degrees C.
  6. Manufacturer and Product: Hirschmann; RS-20 with specified ports, or approved equal.

2.05 PATCH PANELS

- A. Single-Mode Fiber Patch Panel (24 Point)
1. Panel shall come complete with a 24-point single-mode fiber patch panel, fiber management, and bend radius control. Unit shall be 19-inch rack mountable.
  2. Preloaded with 24 ST adapters.
  3. Manufacturer and Product: Ortronics; Model OR-625MMC-24PA1RB, or approved equal.
- B. RJ-45 Patch Panel (24 Port)
1. Panel shall come complete with a 24-point twisted-pair copper patch panel, fiber management, and bend radius control. Units shall be 19-inch rack mountable.
  2. Meets EIA/TIA Category 6 performance.
  3. Manufacturer and Product: Ortronics; Model OR-PSD66U24, or approved equal.

2.06 EQUIPMENT RACK AND NETWORK INTERFACE PANEL ACCESSORIES

- A. Horizontal Cable Management Panel: Panel shall provide management of patch cable horizontally.
  - 1. Manufacturer and Product: Ortronics; Model OR-808044549, or approved equal.
- B. Rack-Mounted Power Strip: 19-inch rack-mounted power strip with eight 20-amp outlets.
  - 1. Power cord length: 15 feet, minimum.
  - 2. Plug configuration: L5-20P twist-lock connector
  - 3. Manufacturer and Product: Ortronics; Model OR-50900052-TL, or approved equal.
- C. Power Distribution Panel: DIN-rail mounted circuit breakers mounted on 19-inch rack-mounted back panel.
  - 1. Manufacturer: Weidmueller; Phoenix Contact, or approved equal.

2.07 PERSONNEL AREA SERVER ROOM EQUIPMENT RACKS

- A. Four-Post Racks
  - 1. Construction
    - a. Four-post anodized aluminum frame construction
    - b. Color: Black
    - c. 19 inches wide by 36 inches deep by 84 inches high, minimum
    - d. Four vertical mounting rails 45 rack mounting units for each rack section
    - e. Solid sides and ventilated top panels
    - f. Perforated metal front and rear access doors
    - g. Manufacturer and Product: Chatsworth Products Inc.; M Series, or approved equal.

2. Major Components

- a. Network servers
- b. Horizontal cable management panel
- c. rack-mounted power strip
- d. Power distribution panel

B. Power Supply: Connect the rack-mounted power strip at each equipment rack section to its overhead receptacle using the power strip's integral power cord and L5-20P twist-lock connector. Equipment rack components will be powered from the rack-mounted power strip.

C. Two-Post Racks

1. Construction

- a. Two-post anodized aluminum frame construction
- b. Color: Black
- c. 19 inches wide by 12 inches deep by 84 inches high, minimum
- d. Two vertical mounting rails 45 rack mounting units for each rack section
- e. Double-sided, 6-inch wide, covered cable management system
- f. Manufacturer and Product: Chatsworth Products Inc.; Universal Series, or approved equal.

2. Major Components

- a. Switches
- b. Patch Panels
- c. Horizontal cable management panel.
- d. Power Supply: Connect the rack-mounted power strip at each equipment rack section to its overhead receptacle using the power strip's integral power cord and L5-20P twist-lock connector. All equipment rack components will be powered from the rack-mounted power strip.

2.08 NETWORK INTERFACE PANELS

A. Locations and Tags

1. 4S-NIP
2. 4N-NIP
3. 5S-NIP
4. 5N-NIP
5. 6S-NIP
6. 6N-NIP

B. Network Interface Panels shall house the following major components.

1. Network switches
2. Fiber patch panels
3. RJ-45 patch panels (minimum of one per NIP, whether shown or not)
4. Fiber optic cable management area
5. Horizontal cable management panel
6. One rack-mounted power strip
7. Power distribution panel

C. Configure the network equipment panel to receive power from a single UPS-backed power circuit.

2.09 FIBER OPTIC CABLE - MULTIMODE:

A. See Contract Specification 16121 – Wires and Cables – 600Vs and Below.

2.10 FIBER OPTIC CABLE ACCESSORIES

A. Fiber Connectors

1. Features

- a. In accordance with requirements of TIA/EIA 568, Section 12.4.3 or Annex F.
- b. SC and ST connectors with 12.7 millimeter spacing between ferrules.
- c. Pull Strength: 0.2 N minimum.
- d. Durability: Sustain minimum 500 mating cycles without violating other requirements.
  - (1) Ferrules: Free-floating low loss ceramic.
  - (2) Polarizing key on duplex connector systems.

2. Attenuation

- a. In accordance with requirements of TIA/EIA 568, Section 12.4.4.
- b. Maximum of 0.75 dB per connector pair.

3. Manufacturer: Ortronics, or approved equal.

B. Fiber Jumper Cables

1. In accordance with requirements of TIA/EIA 568, Section 12.5.

2. Function: To connect from fiber centers to network nodes, such as computer workstations.

3. Fiber Characteristics: In accordance with requirements for fiber optic cable.

4. Cable Configuration

- a. Individual tight-buffer thermoplastic, fibers single mode, to match fibers being jumpered.
- b. Protected with kevlar strength members and enclosed in thermoplastic jacket.

5. Length: Standard, to meet requirements shown, plus minimum 3 meters at workstations.

6. Connectors

- a. As required by Article Connectors
- b. On-axial Pull Strength: 33 N
- c. Normal-to-Axial Pull Strength: 22 N

2.11 STANDARD SOFTWARE

A. The following standard software will be supplied by the PICS System Integrator for installation by the Owner's control system programmer for use on the project:

- 1. Hirschmann Industrial HiVision – 100 Nodes Network Configuration, or approved equal. Software: One Copy.

2.12 RACEWAY SYSTEM

A. A complete raceway system shall be provided for telecommunications in accordance with riser diagrams shown meeting the requirements of Section 16130 - Electrical Raceway Systems.

B. Empty conduits shall be provided with pull wire to facilitate pulling of cables.

2.13 VOICE AND DATA OUTLETS

- A. All outlets shall be in accordance with the communication standard EIA/TIA-568B.
- B. Each outlet shall have one (1) Voice Cable and one (1) Data Cable terminated on the station side as follows:
  - 1. Four (4) RJ45 Jacks that together fit a Single Gang Opening with two (2) white receptacles (voice) for Category 6 wire (gray) and two (2) orange receptacles (data) for the Category 6 (blue) wire.
- C. Each hardwire telephone shall be connected to the telephone backboard with yellow coded jacket to distinguish it from the standard telephone connection.

2.14 CABLING

- A. Cabling between voice/data outlets and distribution racks shall meet the requirements for voice and data cable in Sections 16121 - Wire and Cable - 600 Volts and Below.
- B. All Category 6 cabling shall be in full compliance with EIA/TIA-568B Commercial Building Telecommunications Standard and EIA/TIA-569B Commercial Building Standard for Telecommunications Pathways and Spaces.
- C. Category 6 Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.
  - 1. Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
  - 2. IDC Connecting Hardware: Consistent throughout project.
- D. Category 6 Patch Cords shall be factory-made, four-pair cables in 48-inch (1200-mm) lengths terminated with RJ-45 plug at each end. Use keyed plugs for data service.

2.15 GROUNDING AND BONDING

- A. Comply with NFPA 70, TIA/EIA-607 and UL 467.



## PART 3 EXECUTION

### 3.01 PREPARATION

A. Ensure that installed conduit system conforms to fiber optic system requirements, including:

1. Conduits: Size and number.
2. Access Holes, Handholes, and Pull Boxes: Location and size, to ensure cables and innerducts can be installed without exceeding manufacturer's limitations.
3. Outlet Boxes: Size to coordinate with outlet cover plates for adequate volume and bend radius.

B. Fiber Optic Cable

1. Installation by manufacturer certified installer
2. Install cables in accordance with manufacturer's requirements.
3. Install cable directly from shipping reels. Ensure that cable is not:
  - a. Dented, nicked, or kinked
  - b. Subjected to pull stress greater, or bend radius less, than manufacturer's specification
  - c. Subjected to treatment that may damage fiber strands during installation
4. If calculation indicates that cable will attenuate signals more than 8 dB, reroute may be allowed, if approved by Construction Manager.
5. Splices: None. Install fiber optic cables in unspliced lengths between fiber patch panels.
6. Identification: Identify cable on both ends and in access holes and pull points it goes through.

C. Cable Terminations

1. Terminate cables in accordance with TIA/EIA 568.
2. Fan out fiber cable to allow direct connectorization of connectors. Sleeve over individual fibers with transparent furcation tubes. At point of

convergence of furcation tubes, provide strain relief with metal or high density plastic fan-out collar.

3. Break-Out Kits

- a. Terminate cables using manufacturer-supplied break-out kits.
- b. Terminate in accordance with manufacturer's recommendations.

4. Slack

- a. Fiber Centers, Hubs, and Switches: Minimum, 3-meter slack fiber at each end, coiled neatly in cable management equipment.
- b. Communications Management Outlets: Minimum, 1-meter slack fiber, coiled neatly in outlet box.

5. Connectors

- a. Terminate 100 percent of fibers in each cable to specified connectors.
- b. Connect into fiber management system.

3.02 FIELD QUALITY CONTROL

- A. Provide equipment, instrumentation, supplies, and skilled staff necessary to perform testing. Construction Manager shall have the option to witness and participate actively in onsite tests. Advise Construction Manager at least 24 hours in advance of each test.
- B. Preinstallation Testing: To ensure that fibers conform to manufacturer's attenuation specifications and that no damage occurred to cable during shipping.
  - 1. Prior to physical placement of fiber optic cable, test each fiber while on cable spool.
  - 2. Use OTDR at wave length of 850 nm.
  - 3. Test Documentation: Hard copy of OTDR plots for each fiber.
- C. Post-Installation Testing
  - 1. After termination test all fibers. Test from Operations Building fiber optic patch panels to each end device to determine losses.
  - 2. Test in single direction with OTDR at wave lengths of 850 nm and 1,300 nm.
  - 3. Test bi-directionally with power meter and light source at wave lengths of 850 nm and 1,300 nm to determine loss.

4. All outlets shall be tested using specialized testing equipment. Record the results and turn over to City of New York.
5. Test Documentation: For each fiber:
  - a. Hard copy of OTDR plots
  - b. Results of bi-directional test with power meter and light source
  - c. A letter of certification stating compliance with EIA/TIA-568 shall be furnished along with a written report showing test results on all tested parameters.

D. Communications Infrastructure Test (CIT)

1. Test the Ethernet LAN portion of the Local Area Network by "pinging" all Ethernet nodes from an operator workstation located in the Operations Building.
2. Test Documentation: Test procedures, forms, and checklists shall be signed by the Construction Manager.

3.03 INSTALLATION

- A. General: Install telephone system as shown or required. Comply with requirements of the NYCBC, NEC and local electrical codes.
- B. Install communication outlets, conduit systems wiring, and plywood mounting panels as indicated, in accordance with the drawings and with recognized industry practices.
- C. Install Uninterruptable Power System in telephone and data system provider main terminal room.
- D. All telephone and data wire or cable shall be installed in raceway that complies with the requirements of Division 16 Section "Electric Raceway System."

3.04 LABELING

- A. All Communication Outlets, Patch Panels, Terminal Blocks are to be machine labeled in contrasting colors with a unique location number and the designation (voice or data).
- B. Each cable shall be identified on both ends using wire tags. The cable shall have 18" excess length on the communication outlet side and 36" excess at the terminal board side.
- C. Handwritten labels are not acceptable.

3.05 SEPARATION FROM EMI SOURCES

- A. Comply with BICSI TDM and TIA/EIA-569-A recommendations for minimum separation between communication cables and potential EMI sources.

3.06 TESTING

- A. At the completion of the cabling installation, all outlets shall be tested using specialized testing equipment.
- B. A letter of certification stating compliance with EIA/TIA-568 shall be furnished along with a written report showing test results on all tested parameters.

3.07 TERMINATIONS

- A. All Voice and Data Cables shall be terminated as follows:
  - 1. Voice Cables shall be terminated in Category 6 cable compliant 110 position block. All pairs shall be cut down and terminated.
  - 2. Data Cables shall be terminated in Category 6 compliant Patch Panel. Spare capacity of 20 percent shall be provided.

3.08 EXAMINATION

- A. Examine areas and conditions under which telephone conduit systems and plywood mounting panels are to be installed. Correct conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Resident Engineer.

-END OF SECTION-

**Southwest Brooklyn Marine Transfer Station**

**FMS No. S216-399A**

NO TEXT ON THIS PAGE

**Section 16751**  
**ACCESS CONTROL SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish a complete access control system. The system shall include all necessary workstations, software, card reader, power supplies, door position switches, conduit, cable and accessories for a complete operational access control system.
- B. The access control system provided under this Contract must be compatible with the proximity cards and card readers located at other City of New York Transfer Stations.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01821 – Training
- B. Section 08711 – Door Hardware
- C. Section 13851 – Fire Alarm and Detection System
- D. Section 16050 - Basic Electrical Materials and Methods
- E. Section 16121 - Wires and Cables - 600 Volts and Below
- F. Section 16130 - Electrical Raceway Systems

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEC - National Electrical Code
  - 2. NYCBC – New York City Building Code
  - 3. UL 294 - Standard for Access Control System Units

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Section 01330 – Shop Drawings and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.
- C. Shop Drawings: Furnish shop drawings for the access control system including the following:
  - 1. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions. Wiring diagrams shall be specific for this project.

2. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.
3. Furnish system diagrams showing interconnections between different pieces of equipment. Clearly differentiate between shop-installed portions of wiring and field installed portions.
4. Furnish front elevations of panels and racks showing space allocation of equipment.

#### 1.05 REFERENCE ABBREVIATIONS

- A. This specifications references abbreviations in accordance with the following list:

1. ACS - Access Control System
2. ODBC - Open Database Connectivity
3. RDBMS - Relational Database Management System
4. ICS - Intelligent System Controller
5. ICM - Input Control Module
6. OCM - Output Control Module
7. SRI - Single Reader Interface Module (SRI)

#### 1.06 SYSTEM DESCRIPTION

- A. General: The access control system (ACS) shall provide a number of functions including the ability to regulate access through specific doors and gates to secured areas of the City's facility and provide computer generated color employee credentials for that use. The ACS shall utilize a single seamlessly integrated relational database for all functionality. This integration shall be provided with one operating environment. The ACS software shall integrate all functions (access control, alarm monitoring, ID Management, etc.) into a single program.
- B. The Intelligent Access Control System shall allow the configuration an alarm monitoring server, and an integrated workstation, which can control all functions. The System shall be expandable to support up to 5 individual module or integrated workstations. All access control field hardware shall be connected to the integrated workstation.
- C. The alarm monitoring client workstation shall be able to connect to, and monitor, field hardware devices. Administrative tasks including defining access groups, time zones, generating reports, creating floor plans, etc. shall be provided from any server on the network that is licensed to do so. The integrated server shall allow for any combination of functions of the ACS to be available from the single client workstation. All ACS data shall reside on a single database on the network and shall be accessible in real time to every / any ACS workstation connected to the network. This shall allow for automatic change propagation to all client

workstations on the ACS as well as a common database to consolidate all information and allow for better disaster recovery.

- D. System shall be capable of incorporating existing proximity access control cards from other City of New York facilities provided by HID Corporation.
- E. The System shall be designed to perform a wide variety of feature rich functions as part of a Total Security Knowledge Management Solution. These ACS functions are categorized into primary "system modules" which shall include, but not be limited to:
  - 1. Access Control: The ACS shall grant or deny access, define access levels, and set time zones and holidays. The ACS shall support features such as area control (two man control, hard, soft, and timed anti-passback), database segmentation, and time zone/holiday overrides.
  - 2. Alarm Monitoring: The ACS shall be used for alarm monitoring. Alarms are to be prioritized and displayed on the main alarm monitoring window which provides information about the time, location of the alarm and priority. The main alarm monitoring window shall allow sorting of any field. The ACS shall allow unique emergency instructions to be specified for each type of alarm such as automatic sending of alphanumeric pages or e-mail messages upon alarm arrival.
  - 3. Credential Management: The ACS shall include a seamlessly integrated ID management module. The ID management functionality shall allow the enrollment of cardholders into the database, capturing of images and signatures, and import/export of employee data. This functionality shall also allow the System Operator to assign and/or modify the access rights of a cardholder.
  - 4. System Administrative tasks such as defining permissions set-up, access groups, time zones, reports, etc. shall be provided from any workstation on the network.
  - 5. Badge Layout Creation and Editing: The access control system shall provide a badge layout creation and editing module to allow for the creation of custom badge designs to be created by the City. The system shall support credit card, government, and custom ID card sizes in either a landscape or portrait format and shall support double sided and edge to edge printing.
  - 6. Screens/Forms Creation: Provide a forms designing and editing module that gives City the ability to modify any standard field to customize the cardholder forms as desired.
  - 7. Graphical Floor Plan Creation: The system shall provide graphical floor plan creation and editing software that allows the System Administrators to



import or customized floor plans of the facility and to attach custom icons to those plans.

8. Data Import: Provide an import utility that will allow the City to import cardholder information into the ACS database.

- a. Bi-Directional Data Exchange

- (1) The system shall support a real time, bi-directional data interface to external databases. The interface shall allow data to be imported into or exported out of the system in real time or in a batch mode basis. Data used for import shall be retrieved directly from an external database or through an import file. Data provided for export shall be applied directly to an external database or through an export file. Any data shall be imported or exported including image data. The file used for import or created by export shall have the ability to be structured in a wide variety of ways, but shall always be in ASCII text format.
- (2) The system shall also support a one step download and distribution process of cardholder and security information from the external database to the system database, all the way down to the Intelligent Field Controller (ISC) database. This shall be a guaranteed process, even if the communication path between the system database server and the ISC is broken. If the communication path is broken, the data shall be stored in a temporary queue and shall be automatically downloaded once the communication path is restored.

## 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.

## 1.08 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by UL or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

## 1.09 WARRANTY

- A. Furnish a written 2-year minimum warranty for software, programming parts and labor from the access control system manufacturer.

## 1.10 SPARE PARTS

- A. Furnish the following spare parts:
  - 1. Twenty percent but not less than four, of each type of proximity card reader
  - 2. Twenty percent but not less than two, of each type of power supply
  - 3. Two hundred blank proximity access cards
- B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Standard of Quality and General Configuration: Use of manufacturer's name and model or catalog number is for the purpose of establishing the desired characteristics.
- B. Acceptable manufacturers are listed below.
  - 1. Access Control System
    - a. GENETEC Inc. – Synergis
    - b. S2 Security
    - c. Or approved equal

## 2.02 ACCESS SYSTEM

- A. General Requirements
  - 1. Source Code Set: All application modules, features, and functions from a single source code set using object-oriented software development techniques and compiled applications. The software has to be the product of a single manufacturer.
  - 2. All system features and functionality listed herein shall ship with each system and be provided on a CD.
  - 3. Licensing: The City shall be provided with as many a software licenses as required to allow full use of the access control system.
  - 4. Open Architecture: The access control system shall have an open architecture design and support industry standards for databases, networks, ID card printers, and video cameras. No customized or proprietary ID badge

creation software or hardware shall be required to operate the access control system.

5. Open Database Connectivity Compliance (ODBC): The access control system shall support a relational database management system with the proper drivers. The database shall be equal to MSDE 2000 and Microsoft SQL Server 2000.
6. Network Support: The access control system shall be designed to support, without limitation, the following industry standard network protocol and topology:
  - a. TCP/IP
  - b. Microsoft LAN Manager (NerBUI)
  - c. NFS Networks
7. Video Input Support
  - a. The system shall support any industry standard video input source that utilizes a Red/Green/Blue (RGB), Composite, or S-Video signal. The system shall allow cardholder photos to be taken from any one of the live video signals listed above or to be scanned in using any industry standard scanning device that utilizes an industry standard TWAIN interface.
  - b. System support for other methods of inputting a cardholder's photo, such as through the use of an industry standard digital camera with an industry standard TWAIN interface, or by importing a photo from any industry standard image file format, shall also be available.
8. The system shall be designed to support any industry standard thermal dye transfer ID card printer.
9. Easy to Use, Graphical User Interface: The access control system shall support a user friendly, Windows graphical user interface and shall be intuitive. All messages and interface text shall be in English prose. All functions shall be either keyboard or mouse driven to allow the System Operators to choose the method of navigating through the screens
10. Application Installation: The access control system shall support a simplified installation procedure using Installation Wizards. The access control system shall automatically detect previous versions installed on the client workstations for fast and efficient upgrade installations.
11. Multimedia Integration: The access control system shall extensively integrate and utilize multimedia.

12. Remote Access Services (RAS): The operating system shall support full remote diagnostics abilities through its remote access services. Full network functionality shall be available over remote links using TCP/IP protocols.
13. Security: Local security shall be available through User ID and required password log-on. The operating system shall also offer government C-2 level certifiable security.
14. Remote Intrusion and Trouble Alarms: Provide the following intrusion and trouble alarms for remote indication:
  - a. Provide a normally open dry contact that closes when any system failure alarm occurs to activate a "Trouble Alarm" at SCADA.
  - b. Provide a normally open dry contact that closes when the any system intrusion alarm occurs to activate an "Intrusion Alarm" at SCADA.

B. Client/Server Relational Database Management Systems

1. Open Database Connectivity (ODBC), shall be true client/server, high performance, and ANSI standard capable of handling high transaction rates and multiple users concurrently accessing and modifying the database. The access control system's RDBMS shall preserve data integrity in the following ways:
2. Transaction Processing: Transaction processing guarantees the consistency and recoverability of the RDBMS. Transaction processing shall assure that all transactions are performed as a single unit of work, even in the presence of a hardware or general failure.
3. Enforced Data Integrity: The RDBMS shall enforce data integrity within the database itself, guaranteeing that complex business policies will be followed. "Referential Integrity" maintains consistency between multiple tables of a database. The RDBMS shall use data integrity features such as data types, defaults, and rules to enforce data integrity. Stored procedures and triggers shall also be used to insure the integrity and security of data.
4. User-Defined Data Types: The RDBMS shall utilize data types, which provide the simplest form of data integrity by restricting what kinds of information stored.
5. Defaults: The RDBMS shall utilize defaults, which allow specify values to be inserted, if no explicit field value is entered.
6. Rules: The RDBMS shall enforce rules, which are integrity constraints. The RDBMS shall check the value against any rule that has been created for the

specified field. The RDBMS shall also provide stored procedures and triggers as follows.

- a. **Stored Procedures:** Stored procedures increase data integrity by checking command syntax to see if it makes sense and checking to see if the requester has the permissions necessary to execute the command.
- b. **Triggers:** Triggers are associated with particular pieces of data and are automatically initiated whenever attempts to modify that data are made.
- c. **Alarm Routing:** Provide capability of routing any alarm in the system to any workstation.

### C. Functional And Operational Requirements

1. **General:** The design of the access control system shall include devices and equipment to monitor and control access of cardholders to restricted areas, detect and deny unauthorized attempted entries within specific areas, annunciate alarms, and generate reports. The access control system shall also include devices and equipment to detect 'changes of state' of dry contacts for alarm points. The access control system shall also include ID management and badging capabilities for generating and managing ID badges for cardholders.
2. **Customer Responsibilities:** The system suppliers shall configure access control system, as well as creating floor plans.
3. **Operational Concept:** The access control system shall consist of equipment and devices placed at predetermined locations to ensure that only cardholders authorized to enter secured areas through certain doors or gates can do so. This shall be accomplished by means of a computer(s) and electronic devices used in conjunction with door locks, gate operators, card readers.
4. The employee data screen shall contain at a minimum 20 data entry fields of information that will include, but not be limited to, the following:
  - a. Name: Last Name, First Name, Middle Initial
  - b. Address
  - c. Home Phone
  - d. Employee ID Number
  - e. Title
  - f. Cardholder Number
  - g. Department
5. As a fundamental operation, the system shall provide a seamlessly integrated link between the ID Management and Access Control & Alarm Monitoring

functionality. This will allow specific information concerning cardholders to be automatically downloaded to all Intelligent System Controllers and to be shared by both the access control and ID management modules utilizing a single database, thus enabling the system to grant or deny access to card reader controlled access points. This is to be provided under a single operating environment.

- D. **System Capacities:** The access control system shall support up to 64 card readers. The database shall support an unlimited number of cardholders. The database server shall also support an unlimited number of access events and system operator transactions in the history file. The access control system shall support up to five (5) client workstations. A fully loaded system shall guarantee a one half-second response time for access granted/denied decisions from the time that a cardholder swipes his/her badge.
- E. **Access Control and Time Zones**
1. **Time Zones:** The system shall be capable of creating and storing up to two hundred fifty five (255) time zones. Each time zone shall have a minimum of six (6) intervals. Each interval shall be assignable to any day of the week and capable of being restricted on a minimum of eight (8) types of holidays. Time zones shall be assigned an alphanumeric name using up to 32 characters and shall act as templates to be applied to access levels, card reader modes, alarm inputs, alarm outputs, and alarm masking and logging functions.
  2. **Access Levels:** Standard and temporary access levels shall be as follows:
    - a. All cardholders shall have a minimum of 255 standard and temporary access levels based on facility, card reader, time, and day. .
    - b. The access control system shall define access levels which shall be assigned an alphanumeric name which combine card readers and time zones. Card readers shall have the ability to be assigned to any or all access levels defined in the access control system. As such, an access level can consist of any or all card readers in the system. Time zones shall be allowed to belong to any or all access levels so that the time zone only has to be defined once.
    - c. Access levels shall be able to consist of multiple card reader assignments; each card reader shall be capable of having a distinct time zone assigned.
  3. **Temporary Access Levels:** The ACS shall allow temporary access levels to be defined that combine card readers, activation date, deactivation date and time zones. Card readers shall have the ability to be assigned to all temporary

access levels and a temporary access level can consist of all card readers in the ACS.

4. Access Groups: Access Groups shall be assigned an alphanumeric name and shall allow grouping of access levels together for ease of assignment of access levels to cardholders.
5. Precision Access Levels: Provide precision access levels in addition to the 255 standard and temporary access levels.
6. Inclusion Access Levels: Provide inclusion access levels to offer the ability to assign unique inclusion access level groups (card reader/time zone combinations) for each individual cardholder, in addition to the cardholder's thirty two standard access levels.
7. Holidays and Daylight Savings Time: The access control system shall include a calendar that includes the standard holidays and daylight savings times shall automatically take effect without user intervention. The calendar shall support a minimum of one hundred (100) years beyond the current date. The designation of additional holidays shall be definable. In addition there shall be support for holiday ranges that allow a single holiday to span across multiple calendar days.
8. Field Hardware Communications
  - a. The access control system shall communicate with the field devices by either RS-485 or RS-232 EIA standard.
  - b. The ACS software shall take full advantage of its multi-tasking capabilities, allowing downloads of cardholder data and any ISC information to take place while monitoring and receiving alarms from the field hardware. Downloading database changes shall not interfere with any output control, access decisions, alarm monitoring, traces, or any other required function of the field hardware and alarm monitoring client workstation.
  - c. Upon losing and then restoring communications between the ISC and the ACS database and the local database in each ISC shall be fast and efficient. Every change made to the ISC database shall establish a time/date stamp for the change. When communications are restored, database synchronization shall occur immediately and without System Operator intervention.
9. Multi-Drop Panel Support: The access control system shall support a multi-drop architecture whereby up to eight field devices can be connected on a single RS-485 communications line and all eight panels communicate back to a single serial communications port via a RS232 to RS-485 converter

attached to the workstation. The multi-drop panel support shall be used in conjunction with other wiring support such as the star wiring configuration, home-run wire architecture, and advanced distributed network architecture.

10. Field Hardware Configuration: All field hardware configuration windows shall be accessed from either icon toolbar or from menu options in the menu bar within the configuration module of the software. When a field hardware device is configured, it shall appear in the graphical system overview tree and in all appropriate forms.
11. Alarm Masking Groups: The group alarm masking feature allows creation of groups of alarm inputs to mask or unmask multiple input control module inputs and card reader inputs simultaneously. The following events shall have the ability to be part of an alarm masking group:
  - a. Input Control Module Events
    - (1) Alarm Input Active
  - b. Card Reader Events
    - (1) Auxiliary Input Active
    - (2) Denied Count Exceeded
    - (3) Door Contact Tamper
    - (4) Door Forced Open
    - (5) Door Held Open
    - (6) Card Reader Input Tamper
12. Cardholder Use Limits: A cardholder use limit feature shall be provided to set the maximum number of times that a cardholder may use his or her ID card at card readers.
13. Extended Individual Strike Times: The extended individual strike times allows a card reader's strike to be active for an extended period of time beyond the pre-determined standard strike time on a per cardholder basis. The extended strike time shall be user definable up to 255 seconds.
14. Extended Individual Door Held Open Times: The extended individual door held open times that allows a card reader's door to be held open for an extended period of time beyond the pre-determined standard held open time on a per cardholder basis. The extended held open time shall be user definable up to 255 seconds.
15. Graphical System Overview Tree: A graphical system overview tree shall be available to depict a graphical representation of all access control field hardware, access levels, time zones, access groups, holidays, and card formats that have been configured in the access control system.



16. Pre-Alarm: A pre-alarm at the card readers in the field will sound a tone at the card reader after a valid access has been granted and then the door contact opens. If the door does not close within an adjustable 255 seconds after the pre-alarm sounds, a 'door held open' alarm shall be generated and sent to the appropriate alarm monitoring workstations
17. Alarm/Event Logging: All alarms and events in the access control system shall by default log to the database that shall be used for reporting and back-up capabilities.
18. Scheduling Utility: The scheduling utility shall allow scheduling actions to occur on a one-time or a recurring basis. Recurring schedules shall be configured to begin immediately, last indefinitely, or have optional start and end dates.
19. On-Line Contact Sensitive Help: Provide on-line contact sensitive help files to guide in the configuration and operation of the access control system. The help menu shall be available from any window in the access control system by pressing the F1 function key or clicking on the Help icon in the toolbar. Help windows shall be contact sensitive so you can move from form to form without leaving the help window. Standard Windows help commands for Contents, Search, Back, and Print shall also be available. The system shall also come with complete on-line documentation on CD.
20. Monitor Zones: The access control system shall provide the ability to segment access control system field hardware devices into various zones or areas of which alarm monitoring workstations will monitor. These zones shall be assigned an alphanumeric name and shall consist of one or more access panels, card readers, alarm panels, alarm inputs, alarm outputs, along with any associated alarm/event/time zone associations. These zones shall then be assigned to the alarm monitoring workstations that will monitor the assigned areas.
21. Alarm/Event Routing: The access control system shall be capable of routing alarms and events to various alarm monitoring workstations on the network.
22. Text Instructions: A set of text instructions to be associated with each alarm that arrives into the access control system shall be provided.
23. Alarm Attributes: The access control system shall have the capability to configure how it handles the annunciation of alarms on an individual basis. Each alarm and/or event shall have the following options:
  - a. Display at one or more alarm monitoring workstation.
  - b. Allow higher priority alarms to be displayed on the alarm monitoring workstation ahead of lower priority alarms.

- c. Require the field device, which generated the alarm to be restored to its normal state before the alarm, shall be cleared from the alarm monitoring window.
  - d. Have the alarm breakthrough to the alarm monitoring window when another application on the alarm monitoring workstation becomes active.
  - e. Require that the alarm not be deleted from the alarm monitoring window upon acknowledgment.
  - f. Display text outlining the procedures to follow when responding to the alarm.
  - g. Require a password to be entered to acknowledge the alarm.
  - h. Require acknowledgment to clear.
  - i. Allow mandatory journal entry upon acknowledgment.
  - j. Have pre-defined "canned" journal entries for alarms in the access control system.
  - k. Have the alarm appear on the alarm monitoring window with a flashing colored bar across the alarm for high priority alarms. Each priority shall have its own unique color assigned to it. A minimum of 255 colors shall be available for assignment to a minimum of 255 priority levels.
  - l. Have the alarm, when acknowledged, display a different flashing colored bar across the alarm than for the original alarm color. Each acknowledged priority shall have its own unique color assigned to it. A minimum of 255 colors shall be available for assignment to a minimum of 255 priority levels.
24. System Downloads: After configuring field hardware devices, all the database information shall be downloadable.
25. Card Reader Options: The access control system shall have the ability to set the following options for each card reader:
- a. Allow User Commands: This feature shall allow keypad functions to be performed at the card reader's keypad.
  - b. Rename Auxiliary Inputs: This feature shall allow renaming the card reader's auxiliary inputs.

- c. Rename Auxiliary Outputs: This feature shall allow renaming the card reader's auxiliary outputs.
  - d. Activate Outputs: - This feature will allow activation of auxiliary outputs attached to the card reader on a time zone basis.
- 26. Input Control Module Options: The access control system shall have the ability to set the options for each input or output configured on the Input Control Modules.
  - 27. Alarm Handling: The System Operator shall be able to select alarm/events by clicking on it with the mouse.
  - 28. Current Status Indication: The alarm monitoring window shall display the current status of alarms, card readers, ISCs and ICMs.
  - 29. Cardholder Record Call-up: The System Operator shall be able to display a cardholder record with the stored cardholder's image. This feature shall be user configurable to be automatic.
  - 30. Cardholder, Card Reader, or any Field Hardware Device Trace: The access control system shall be able to initiate several traces of cardholders, and/or field hardware devices while monitoring alarms.
  - 31. 'On the Fly' New Login of System Operators: The access control system shall allow a new operator to login over another operator who is already logged into the same workstation.
  - 32. Test Mode: The access control system shall support a Test Mode. The access control system shall be able to perform tests on input device groups, door forced open and access grants to verify that all equipment and programming are operational.
  - 33. Manual Control: From the alarm monitoring window, the access control system shall have the ability to dictate manual control of all output points or input points connected to the access control system. Control points are defined as any door strike, auxiliary card reader output, or any other relay output points.
  - 34. Real-Time, Dynamic Floor Plans: The ASC shall support real time floor plans that shall be appear in the alarm monitoring workstation either on command or when specified alarms are selected for acknowledgment.
  - 35. Manual Override of Card Readers: The ACS shall allow the System Operator to override card readers and shall be able to manually open a door from the alarm monitoring window, the floor plan. In addition, the System

Operator or based on schedule can set a door to be left unlocked to allow easier access during normal working hours.

36. Hardware Update Timer: A hardware update timer sets how often system status updates take place. These updates are reflected in the status bar and the real-time graphical system status tree. This frequency shall be defined in one-minute increments and shall be changed 'on the fly'.

F. Enrollment and Badge Creation

1. Enrollment: The access control system shall be able to enroll cardholders on a one by one basis. The enrollment system shall include the following attributes:
  - a. Name
  - b. Badge Type
  - c. Image
  - d. Deactivation Date
  - e. Access Levels
  - f. Badge Design Layout
  - g. Information to be Encoded onto the Magnetic Stripe on the back of the badge.
2. Image Capture from a Live Video Source: The Enrollment & Badging workstation shall include all equipment required to capture a high quality image with flash lighting at a minimum resolution of 1024 x 968.
3. Image Import: The access control system shall have the ability to import and modify a cardholder's image from, but not limited to the following image formats:
  - a. Bitmaps (.bmp, .dib)
  - b. JPEG (.jpg)
  - c. TIFF (.tif)
  - d. Windows Metafile (.wmf)
  - e. Adobe Photoshop (.psd)
  - f. Kodak Photo CD (.pcd)
4. Chromakey: The access control system shall support an advanced chromakey feature, which has the ability to remove the color that resides in the top left corner of the crop window, or remove the color. A tolerance setting shall be available for fine tuning images of cardholders whose shirt, hair, etc. is close to the color of the background.
5. Signature Capture: The access control system shall have the ability to capture a cardholder's signature.

6. In-line Magnetic Stripe Encoding: Utilizing a magnetic stripe encoding device, the access control system shall allow for magnetic stripe encoding of all its permanent credentials. This magnetic stripe shall conform to ABA Track II and ANSI specifications.
7. Access Control Reports: The ACS shall provide standard ACS reports that are stored in the ACS database.

## 2.03 SYSTEM WORKSTATION & PERIPHERAL REQUIREMENTS

- A. Provide a dedicated server for hosting access control system and workstations for City of New York's PC's. Access control systems servers and workstations having following minimum features:
  1. Processor: Dual Core Intel Xeon 5110 (1.60GHz, 1066MHz FSB 4MB Cache)
  2. Memory: 2GB of SDRAM
  3. Monitor: 17-inch Rack mountable LCD
  4. Hard Drive: 73GB 15K RPS SCSI hard drive
  5. Network Card: Dual 10/ 100/ 1000 Ethernet Communication
  6. 48X IDE CD-RW/DVD
  7. Digital Tape Backup System
  8. Pullout Keyboard and trackball
  9. Graphics accelerator Card
  10. Documentation: Provide all documentation, manuals and licenses
  11. Safety/Regulatory: UL, FCC B, approved
  12. Latest revision of software at time of bid required:
    - a. Windows XP Professional or approved equal
    - b. Microsoft Office Professional or approved equal
    - c. McAfee Virus Scan or approved equal
  13. Operator's Software: Provide access control system operator's software.
- B. Dedicated Server
- C. WorkStation
  1. Processor: Intel Core 2 Duo Processor E6300(1.86GHz, 2M, 1066MHz FSB)
  2. Memory: 2GB of SDRAM
  3. Monitor:
    - a. LCD Type: 19-inch TFT active matrix
    - b. Video Input Signal: Analog RGB and digital DVI-D
    - c. Pixel Pitch: No greater than 0.294 mm
    - d. Viewing Angle: 85 degrees nominal
    - e. Contract Ratio: 600:1

- f. Brightness: 250 nits
  - g. Prime Mode: 1280 x 1024 (SXGA)
  - h. Mounting: VESA-compliant adapter plate)
- 4. Graphics accelerator card
- 5. Hard Drive: 80 GB minimum
- 6. Floppy Drive: 3.5", 1.44 MB diskette
- 7. CDRW: 40X
- 8. Digital Tape Backup System
- 9. Mouse: Microsoft System Intellimouse
- 10. Network Card: 3 Com 3C905 Fast Etherlink XL 10/100 PCI Network Interface
- 11. Keyboard: 104+ keys
- 12. Documentation: Provide all documentation, manuals and licenses
- 13. Safety/Regulatory: UL, FCC B, approved
- 14. Latest revision of software at time of bid required:
  - a. Windows XP Professional or approved equal
  - b. Microsoft Office Professional or approved equal
  - c. McAfee Virus Scan or approved equal
- 15. Operator's Software: Provide access control system operator's software.
- D. Provide an ID badge printer which supports double-sided full color printing. The printer shall also support edge to edge printing.
- E. RAID Level 5: The access control system shall offer a Fault Tolerant Redundant Array of Independent Disks Level 5 (RAID Level 5). RAID 5 stripes both data and parity information across three or more drives. It exchanges the dedicated parity drive for a distributed parity algorithm, writing data and parity blocks across all the drives in the array.

## 2.04 ACCESS CONTROL FIELD HARDWARE DEVICES

- A. General: The ACS shall be equipped with the access control field hardware required to receive alarms and administer all access granted/denied decisions. All field hardware shall be designed to meet UL requirements. Depending upon the configuration, the ACS field hardware shall be able to include any or all of the following components:
  - 1. Intelligent System Controller (ISC): An Intelligent System Controller (ISC) shall link the Total Security Knowledge Management Solutions Software to all other field hardware components (Card Readers and Input Control Modules). The ISC shall provide full distributed processing of access control & alarm monitoring operations. Access levels, hardware configurations, and programmed alarm outputs assigned at the administration workstation shall be downloaded to the ISC, which shall store this information and function.

All access granted/denied decisions shall be made at the ISC to provide fast responses to card reader transactions. A fully configured ISC with 32 card readers shall require less than one-half (0.5) seconds to grant access to an authorized cardholder or deny access to an unauthorized cardholder. The ISC shall contain the following features:

- a. UL 294 and CE Certified
- b. Support for Direct Connect, Remote Dial Up, or Local Area Network (LAN) Connection
- c. Support for up to 512K of On-Board Memory
- d. LAN Support shall utilize RJ45 (10/100baseT) Ethernet Interface
- e. Flash Memory for real time program updates and overall host communications
- f. Memory storage of up to 5,000 cardholders/100,000 events
- g. Downstream ports shall be for connecting card readers and data gathering panels via RS-485 multi-drop wiring configuration
- h. Support of multiple card technologies
- i. Supervised Communications between ISC and access control system Software
- j. Support of up to eight card formats and facility codes
- k. RS-485 Full Duplex, communication channel to the access control system head-end
- l. Integration to other manufacturer's card readers
- m. Uninterruptible Power Supply (UPS) with battery backup (20 Minute Minimum)
- n. 12 VAC or 12 VDC input power
- o. Issue Code Support for Wiegand Card Format
- p. Individual Shunt Times (ADA Requirement)
- q. Up to Nine Digit PIN Codes

- r. Downstream serial RS-232 device support
  - s. Status LEDs for normal component and communication status
2. Input Control Module (ICM): The Input Control Module shall monitor all Grades A, B and AA alarm inputs.
- a. The Input Control Modules shall also be able to operate independently and in conjunction with Output Control Modules (OCM), which will send an output signal to a corresponding output device upon alarm input activation. Once an alarm has been received, the Input Control Module shall activate any or all alarm outputs within the Output Control Module. The Output Control Module shall provide 16 Form C outputs rated at 5 A @ 30 VDC. Upon an alarm input from the Input Control Module, the Output Control Module shall transmit an activating signal to a corresponding output device.
  - b. Up to 8 ICMs shall be connected to an available ISC using RS-485 cabling. Diagnostic LEDs shall indicate ISC communication, input zone scanning, and Input Control Module heartbeat.
  - c. The ICM shall contain the following features:
    - (1) UL 294 and CE Certified
    - (2) Alarm contact status scanning at up to 180 times per second for each zone
    - (3) Configuration DIP switches to assign unit addresses and communications speed.
    - (4) A low power CMOS microprocessor
    - (5) Filtered data for noise rejection to prevent false alarms
    - (6) Up to 16 Grade B, A, or AA Supervised Inputs in any Combination
    - (7) 12 VAC or 12 VDC Input Power
    - (8) 2 Form C Contacts for load switching
    - (9) 2 dedicated inputs for tamper and power status



### 3. Output Control Module (OCM)

- a. The Output Control Module shall incorporate 16 Output Relays that are capable of controlling a corresponding output device upon any input activation or on command from the system.
- b. Output relays shall be capable of responding to:
  - (1) Input alarms from a within the same ISC
  - (2) Commands from a System Operator
  - (3) Time zone control commands for automatic operation
- c. Output relays shall be capable of:
  - (1) Pulsing for a predetermined duration. Duration shall be programmable for each relay individually.
  - (2) "Following" any input point an ICM attached to the same ISC (on with alarm, off when clear, or as required).
  - (3) Responding on command from the System Operator to pulse, command on, command off, or reset to normal state.
  - (4) Each OCM shall provide 16 Form C relays rated at 5A @ 30 VDC. The OCM shall control the relays by digital communication. Upon an input from the ICM or command from the System Operator, the ICM will transmit an activating signal to a corresponding relay. The OCM shall be UL 294 and CE Certified.

### 4. Proximity Card Readers

- a. Provide proximity door and man-gate card reader and vehicle gate card readers as shown and shall have the following common features:
  - (1) Each card reader shall contain read head electronics, a micro ISC, and a sender to encode digital door control signals. A bi-color LED (s) (red and green) shall be used to indicate card reader status and access status. A solid green LED shall indicate the card reader has defaulted to an unlocked mode of operation. The green LED shall illuminate upon a valid card swipe/PIN entry for the duration of the door strike time.
  - (2) Card Readers shall be able to support a user defined downloadable off-line mode of operation (locked, unlocked, or facility code), which will go in effect during loss of communication with the ISC.

- (3) All card readers shall provide audible feedback to indicate access granted/denied decisions. All keypad buttons shall provide tactile audible feedback.
  - (4) All card readers shall provide audible feedback to indicate access granted/denied decisions.
  - (5) The card reader shall read the encoded data from the access card and/or transponder and transmit the data back to the host panel in Wiegand Protocol interface.
  - (6) The card reader shall be listed under UL 294 as an access control system unit accessory.
  - (7) The card reader shall have separate terminal control points for the green LED, the red LED, and the audible indicator.
  - (8) The card reader shall have a hold line that will buffer a card read until the panel has asserted that the information can be sent up line.
  - (9) The card reader shall have a re-present mode in which the card shall be taken from the reader field for one second before being read again. This feature is required to prevent multiple reads from a single card presentation.
  - (10) The card reader shall be fully weatherized, and shall have an operating temperature of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius), and shall have an operating humidity of 5-95% noncondensing. The reader shall have a lifetime warranty.
  - (11) The card reader shall be made from polycarbonate material, and shall be charcoal grey.
  - (12) The card reader shall transmit at a 125 kHz frequency. The voltage requirements of the card reader shall be 12 VDC.
- b. Door and Man-Gate Proximity Card Readers: The door and man-gate proximity card readers shall have the following additional features:
- (1) The card reader shall be a ThinLine II proximity designer series card reader, HID Corporation Model No. 5395 or approved equal
  - (2) The card reader shall be no larger than 4.65" x 3.00" x 0.68" (11.9 X 7.6 X 1.7 cm).

- (3) The card reader shall have a read range of 4" to 5.5" (10 - 14 cm), when used with the specified proximity card.
  - (4) The card reader shall be a single unit with a two-piece housing, with an epoxy-potted enclosure and a snap-on cover, and with properly sized mounting holes that allow it to be attached to a US single gang electrical box.
- c. Vehicle Gate Proximity Control Readers The vehicle gate proximity card readers shall have the following additional features:
  - (1) The card reader shall be a MaxiProx proximity card reader, HID Corporation Model No. 5375 or approved equal.
  - (2) The card reader shall be no larger than 12.0" x 12.0" x 1.0" (30.5 X 30.5 X 2.54 cm).
  - (3) The card reader shall have a read range of 16 - 24" (40 - 61 cm), when used with the specified proximity card.
  - (4) The card reader shall be provided with an internal tamper switch that will indicate an alarm condition if an unauthorized attempt is made to disassemble the unit.

5. Single Reader Interface Module (SRI)

- a. The Single Reader Interface Module shall provide an interface between the ISC and card readers. The Single Reader Interface Module shall operate with any card reader that produces a standard Wiegand (Data 1 / Data 0) communication output. As with other card reader types listed above, a single ISC shall be able to multi-drop as many as 16 Single Reader Interface Modules.
- b. Up to sixteen (16) SRIs shall be connected to each ISC. The SRI shall monitor on a per door basis, door position, exit push button, and two auxiliary alarm inputs. It shall also control the electric strike and provide two auxiliary relay outputs.
- c. The SRI shall support up to eight unique card formats.
- d. The SRI shall support an integrated card reader and shall support three access modes upon loss of communication with the ISC; locked, unlocked, and facility code.

The SRI shall offer the following features:

- (1) UL 294 and CE Certified
  - (2) 12 VDC Power
  - (3) Support for up to eight Magnetic and Wiegand Card formats
  - (4) Support for Data1/Data0 Wiegand Communications
  - (5) Programmable Inputs and 2 Programmable Relay Outputs
6. Power Supplies for field hardware shall be designed specifically for the system equipment installed. These power supplies shall be regulated, isolated versions for the ISC, ICM, Card Readers and other equipment. Each version shall be available in UPS with battery back-up and non-UPS models. All power supplies shall be housed in locked enclosures that also allow mounting space for the ISC, ICM, SRI, DRI or other device/panel required.
7. The system shall support a star configuration splitter that shall expand a single ISC communications port into eight 2 wire or four 4 wire RS-485 communications ports to be used in a star configuration. All outgoing data shall be broadcast on all eight ports.

## 2.05 PROXIMITY CARDS

A. Provide proximity card that offer the following features:

1. The proximity access cards shall be a ProxCard II proximity access control card, HID Corporation Model No. 1326 or approved equal.
2. The access card shall have a lifetime warranty.
3. The access card shall have up to 84 programmable bits of Wiegand formatted information for universal compatibility with all HID Wiegand interface reader applications.
4. The access card shall be "Passive" (non-battery operated) proximity technology.
5. The access card shall have a permanent ink jet or laser engraved identification number printed onto it. The card shall have an internal identification numbers that matches the external number.
6. The access card shall be slot punched on the short edge of the card for a vertical portrait oriented photo, shall be offered with multicolor custom graphics, and be compatible with PVC labels for use with a direct print printer.
7. The access card shall be no larger than 3.375" x 2.125" (8.57 X 5.40 cm), with a maximum thickness of 0.070" (0.18 cm).

8. The access card shall have an operating temperature of -50 to 160 degrees Fahrenheit (-45 to 70 degrees Celsius), and shall have an operating relative humidity of 5-95% noncondensing.
9. The read range of the access card shall be extremely consistent, and not be affected by body shielding or variable environmental conditions.

## 2.06 CONDUIT AND CABLES

- A. Conduit and boxes: Provide conduit and boxes that meet the requirements of Section 16130 - Electrical Raceway Systems.
- B. Cable: Provide cables meeting the requirements of Section 16121 - Wire and Cable - 600 Volts and Below.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas and conditions under which access control system conduit systems and plywood mounting panels are to be installed. Correct conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Resident Engineer.

### 3.02 INSTALLATION

- A. General: Install access control system as shown or required. Comply with requirements of the NYCBC, NEC and local electrical codes.
- B. All equipment shall be installed as per manufacturer's requirements.
- C. All equipment shall be installed by qualified personnel in accordance with NEC and local codes.

### 3.03 FIELD SERVICES

- A. Manufacturer's Representative: Provide the services of a factory-trained experienced, competent, and authorized representative of the access control system manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01821 - Training. Furnish all instruments and equipment necessary to conduct required tests, adjustments and training. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

- B. All equipment shall be tested for proper operation. Testing shall be observed by City of New York for general compliance with the intended use.
- C. Training: Following completion of installation and field testing provide training for 12 employees of the City of New York in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the DSNY's facilities at a time agreeable to the City of New York:
  - 1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  - 2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.04 CLEANING AND REPAIR

- A. Contractor shall clean out and discard all materials used in the construction of the system.
- B. All damage caused by the Contractor shall be repaired to the original state by the Contractor.
- C. All repairs shall meet the City's satisfaction to be acceptable.

-END OF SECTION-

NO TEXT ON THIS PAGE

**Section 16752**  
**DIGITAL VIDEO SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish a complete digital video system. The system shall include all necessary workstations, software, digital video recording equipment, cameras, IP Encoders, IP Decoders, command consoles, equipment racks, networking switching hardware, and real-time video monitoring equipment, power supplies, conduit, cable and accessories for a complete operational digital video system.

**1.02 RELATED SPECIFICATIONS**

- A. Section 01820 - Training
- B. Section 16050 - Basic Electrical Materials and Methods
- C. Section 16121 - Wires and Cables - 600 Volts and Below
- D. Section 16130 - Electrical Raceway Systems
- E. Section 16264 - Uninterruptible Power Supplies
- F. Section 16511 - Lighting
- G. Section 16723 - Fiber Optic Cable

**1.03 REFERENCES**

- A. Codes and standards referred to in this Section are:
  - 1. NEC - National Electrical Code
  - 2. Electrical Code for the City of New York

**1.04 SUBMITTALS**

- A. General: Furnish all submittals, including the following, as specified in Division 1 and Section 16050 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.
- C. Shop Drawings: Furnish shop drawings for the digital video system including the following:
  - 1. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions.



2. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.

#### 1.05 REFERENCE ABBREVIATIONS

- A. This specifications references abbreviations in accordance with the following list:

1. DVA - Digital Video Appliances
2. DVR - Digital Video Recording
3. DVRS - Digital Video Recording System
4. DVS - Digital Video Server
5. GUI - Graphical User Interface
6. LAN - Local Area Network
7. MOD - Minimum object distance
8. NTSC - National Television System Committee
9. NTU - Network Terminal Unit
10. NDVMS - Network Digital Video Management System
11. PTZ - Pan, Tilt & Zoom

#### 1.06 SYSTEM DESCRIPTION

- A. This section specifies the minimum requirements for a Digital Video Recording System (DVRS), applicable to each Marine Transfer Station.

#### 1.07 SYSTEM DESCRIPTION

- A. The DVRS shall have the capability to scale to accommodate a minimum of 100 cameras installed strategically throughout the building. The majority of the installed cameras will be placed indoors with a certain number of additional cameras to be installed outdoors. The system will support both fixed and PTZ cameras as outlined in the engineering drawings.

#### 1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.

#### 1.09 WARRANTY

- A. Furnish a written 3-year minimum warranty covering software, and all equipment associated with the digital video system including parts and labor from the digital video system manufacturer.

## 1.10 SPARE PARTS

### A. Furnish the following spare parts at each transfer station:

1. One of each type of camera provided
2. One of each type of lens provided.
3. Twenty percent but not less than two, of each type of power supply.

### B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

#### A. Standard of Quality and General Configuration: Use of manufacturer's name and model or catalog number is for the purpose of establishing the desired.

#### B. Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for review.

##### 1. Camera and Accessories

- a. Bosch Security Systems
- b. Honeywell Silent Witness
- c. Vicon Industries Inc.

##### 2. Digital Video Servers

- a. Verint Systems Inc
- b. DVTel Inc.
- c. Vicon Industries Inc.

##### 3. Fiber Optic Transmitters and Multiplexers

- a. Optelecom-NKF Electronics
- b. GE Security (Formerly Fiber Options)

##### 4. Equipment Racks

- a. Gorilla Systems, Inc
- b. Winstead Corp.

5. Network Switch
  - a. Cisco Systems, Inc
  - b. IBM
6. Industrial Monitors
  - a. Allen Bradley
  - b. VarTech Systems Inc.

## 2.02 GENERAL STANDARDS

1. All equipment and materials used shall be standard components that are regularly manufactured and utilized in the manufacturer's system.
2. All equipment and components used shall have been thoroughly tested and proven in actual use.
3. All equipment and components used shall be CE-marked and FCC-certified.
4. All systems and components shall be provided with the availability of a toll-free (US and Canada), technical assistance program (TAP) from the manufacturer. The TAP shall allow for immediate technical assistance for either the dealer/integrator/installer or the end user at no charge.
5. Each dealer/integrator/installer and end user shall have access to a password-protected e-support Web site for Web-based technical assistance on a 24-hour basis. This site will enable downloads of software updates, manuals, review of frequently asked questions, and generation of service tickets with a 24-hour maximum response time.
6. All systems and components shall be provided with a three working days turnaround repair express and 24-hour parts replacement. The repair and parts express service shall be guaranteed by the manufacturer for warranty and non-warranty items.

## 2.03 DIGITAL VIDEO RECORDING SYSTEM MANAGEMENT

### A. Digital Video Recording System Configuration

1. General
  - a. The DVRS shall be configured to provide a minimum of 15 days of video archival, stored automatically on individual 32 input DVR unit's internal hard drive disks. The storage requirement for this system shall be based on a configuration where the cameras, described as security cameras, will be on a recording video schedule initially set for 16

hours per day, Monday through Saturday and switching to motion activated recording all other times. The other cameras are for process observation and no recording is required.

- b. Analog cameras will be distributed into Digital Video Appliances (NTU). The Digital Video Appliances will compress the Analog video signals and provide digital IP based outputs (Dual Stream MPEG4). The IP based compressed signal will then be transmitted into a Network switch. The Digital Video Recorder units will receive the data streams directly from the Network Switch via TCP/IP transmission protocols. The Digital Video Recorder units will then take the compressed video signal and store the video using internal hard drives for archival storage. The Digital Video Appliances shall offer the ability to leverage multiple quality settings (Low, Medium and High).
  - c. Recorders and servers shall consist of rack-mountable PCs connected to the Local Area Network (LAN).
  - d. Video and other data managed by the DVRS shall be accessible from the workstation PCs connected directly to the LAN.
  - e. The DVRS shall include Graphical User Interface (GUI) based client server software Suite designed to run on PC workstations running the latest version of Microsoft Windows XP Professional operating system.
  - f. The DVRS GUI software functions shall include specific software applications within the software Suite that shall include; System Setup and Administration, Live Monitoring, Live and Recorded video retrieval with PTZ camera control, Video playback; Video export, Robust alarm Global monitoring, and other capabilities as described below.
- 2. Compatibility with Analog Video Cameras: The DVRS shall work with cameras that generate a standard NTSC composite video signal. Video Appliance taking feeds from these composite Analog cameras shall use BNC connectors for Video Inputs and provide a digital CAT 6 output to supply a compressed digital signal to the Video Recorders. The DVRS shall support a wide variety of fixed and PTZ Analog Cameras.
  - 3. Compatibility with Digital Video Cameras: The DVRS shall work with a wide variety of IP Cameras for future digital camera integration. The Digital Video Recorders will utilize a standard Ethernet connection for video input via TCP/IP transmission protocols. The DVRS shall be fully scalable to accommodate future camera recording and video management up to 100 cameras.

4. Storage: The DVRS shall be capable of supporting unlimited video storage capacity by offering a hardware architecture that is scalable and configurable to allow external devices such as AIT Tape Libraries or SANS storage devices to be added in the future.
5. Workstations: The DVRS shall be a distributed, multi-user, multi-tasking system capable of supporting simultaneous request from multiple workstations for video call-up and Alarm monitoring.
6. Video Recording Tasks: The DVRS shall be capable of the following tasks:
7. Simultaneous Tasks: The DVR units shall be capable of performing multiple tasks simultaneously, and within practical limits no task shall interfere with any other task. The DVR units shall prioritize tasks so that recording and alarm processing will continue uninterrupted regardless of any number of requests being received from workstations at any given time. DVR units shall be capable of performing the following tasks simultaneously:
  - a. Recording Tasks
    - (1) Storing video to internal hard drives for storage.
    - (2) Maintain an accurate index of video files stored on local disks.
    - (3) Delete older files as needed to free up space to record newer video clips.
    - (4) Be able to selectively transfer recorded video to long-term storage media upon request, automatically if necessary.
  - b. Alarm Tasks
    - (1) Execute video image analysis algorithms including activity detection and video loss detection as well as providing detailed alarm messages.
    - (2) Alarm messages shall allow for priority color-coding of specific cameras and audible audio notification output for all cameras if required.
    - (3) Sending alarm messages to the server or workstation for proper management of alarm responses.
    - (4) Processing alarm response instructions including calling camera presents, changing recording modes, and controlling alarm relay outputs.

## c. Workstation Tasks

- (1) Supplying one or more live video streams with a maximum of 16 live streams of video in the Software GUI.
- (2) Support up to 16 windows of Live and Recorded video streams in the software GUI at the same time for review.
- (3) Enabling one or more users to play back previously recorded video, including "Instant Replay" of video recorded within the last few seconds of video capture.
- (4) Sending real-time commands to PTZ cameras for live camera control.

## 8. Recording Modes: DVR units shall support the following recording modes:

- a. Continuous Recording: DVRS shall be capable of recording 24 hours a day, 7 days a week on a full time recording schedule.
- b. Scheduled Recording: Establish a recording schedule for each camera based on hours of the day and days of the week including recorder settings such as frame rate, resolution, bandwidth and quality settings.
- c. Alarm Recording: Enable the System Administrator to define alarm responses including:
  - (1) Instructions to trigger recording of specified cameras at specified frame rates and quality settings. Alarm responses to include the following recording capabilities:
    - (a) Start recording cameras not currently being recorded.
    - (b) Supplement continuous or scheduled recording by changing the recording mode or triggering recording of the same camera on a different recorder in a different video format.
    - (c) Selectively copy video to long-term storage media upon alarm.
  - (2) System Administrators shall determine whether video will be retained on long-term storage media for each continuous or scheduled recording instruction. Automatically retain video on long-term storage media when video is recorded as a part of a defined response to an alarm event.

- d. On Demand Recording: The DVRS shall allow authorized users to stop and start recording from within the GUI application software.
9. Workstation Software
- a. Multi-Tasking: GUI application software shall enable users to manage multiple windows and perform multiple tasks simultaneously, including the following:
    - (1) Monitoring progress as one or more video clips are retrieved from a long-term storage media and made ready for playback.
    - (2) Allow for scheduling of clips to be downloaded at a specific time for a specific authorized end user.
    - (3) Exporting video to digital media or to an analog output device for permanent, long term storage or investigative usage.
10. Video Window Layouts: Users shall be able to select from the following video window layouts with live or recorded video:
- a. Single Camera view – 1 camera displayed in the entire GUI workspace.
  - b. Quad camera view – 4 cameras arranged in two rows of two individual windows displayed in the entire GUI workspace.
  - c. Three by Three (3 x 3) – 9 total cameras arranged in three rows of three individual windows displayed in the entire GUI workspace.
  - d. Four by Four (4 x 4) – 16 total cameras arranged in four rows of four individual windows displayed in the entire GUI workspace.
  - e. Free: Open, move and size multiple independent video windows as needed in a tile or cascade layout.
11. Aspect Ratio: The software shall ensure that the ratio of the width and height of the displayed video images always matches the ratio that was originally captured regardless of the size of the video window.
12. Zoom: During viewing of live and/or recorded video, the GUI shall allow the user to select an area of interest and zoom in without pausing the video.

13. Image Toolkit: When viewing live or recorded video, the software shall provide functions to work with an individual video image in a paused video window including the following capabilities:
  - a. Print the image to any standard PC based printer.
  - b. Save the image to a common image file format. Image file formats shall include, but not be limited to: .JPG, .BMP, .PSD, Tiff and Targa.
  - c. Copy the image to a clipboard so the image can be pasted into any PC based software application.
  - d. Adjust the brightness and/or contrast of the image.
  - e. Convert the image from color to grayscale.
  - f. Apply filters to the image to de-speckle, smooth, or sharpen the image.
  - g. Apply edge detection to highlight borders or surfaces of objects within the image.
  - h. Add the date and time onto the image.
  - i. Add descriptive text annotation onto the image.
14. Processing Video Requests: When a user submits a video request, the DVRS shall automatically perform whatever tasks are necessary to make the requested video available for playback, regardless of the video storage location.
15. Multiple Video Requests and Video Clips: The DVRS shall enable users to submit and manage multiple requests for video in the following fashion:
  - a. The GUI organizes video requests in a tree structure to maintain the hierarchical relationship between video requests and corresponding video clips.
  - b. Use icons and text to indicate status of requests and video clips.
  - c. The GUI shall list cameras in the group and show a separate video clip icon for each camera, if a request is based on a group of cameras.
  - d. The GUI shall show every available video clip that matches the video request when a camera recorded in more than one video format by more than one recorder at a requested time.



- e. The GUI shall facilitate viewing video clips from a sequence of camera views. For example, clips showing a subject walking through a facility or a package moving along a conveyer belt.
  - f. The GUI to enable the user to use drag-and-drop to re-order the video clips within a group to create the desired sequence of cameras.
  - g. Include a GUI hotkey to open the next video clip in sequence. A function to pause playback in the current video window and open the next video clip in sequence in a new video window. The next video clip shall be positioned to the same time where the previous video clip paused, and the next video clip shall start playing automatically. By pressing the "Next Video Clip" hotkey each time the subject is leaving the camera view, the user can conveniently follow the subject or object through the sequence of video clips.
  - h. The DVRS shall support time-synchronized playback of recorded video on up to 16 windows simultaneously.
16. Controlling Video Playback: After opening a video window to play back a video clip, the GUI shall enable a user to control all aspects of playback.
- a. Playback controls:
    - (1) Single button to start and stop video playback.
    - (2) Single button to step forward or backward through the video in single time increments.
    - (3) Single button to step forward or backward through the video in single frame increments.
    - (4) Single button to step forward or backward through the video in multiple frame increments.
    - (5) Single button for moving through the video frames in Reverse playback mode.
    - (6) The ability to cause the video to loop continuously through a recorded video clip segment.
  - b. Positioning Controls: Slider bars and buttons to quickly and conveniently position to the beginning, end or any other time period within the video clip.
  - c. Speed Control: The DVRS shall incorporate a slider bar to control the rate of playback. Enable the user to select playback speeds that are

slower than, equal to, faster than the rate at which the video was originally recorded.

17. Scanning Recorded Video for Activity: The DVRS shall provide a function to rapidly process video clips and locate images with activity. Activity scanning provides an intelligent substitute for manual "fast forward" and scanning including the following:
  - a. Enables the user, through the GUI, to specify a scanning interval to control the percentage of recorded images that will be checked for activity.
  - b. Provide a GUI function to enable the user to select one or more areas of interest and/or adjust the sensitivity for those scanned areas.
  - c. When activity is detected, the GUI will display a thumbnail of the corresponding video image with a timestamp. The sequence of thumbnails will provide high level overview of the activity in the video clip, allowing the user to make a quick assessment of whether further review is warranted.
  - d. Support Multi-tasking of other investigative functions while Activity Scanning.
  - e. Click on a thumbnail to position the video for the user in the GUI while scanning is still in progress.
  - f. Support video playback of the related clip and/or unrelated clips while scanning is in progress.
18. Requesting Live Video
  - a. The GUI shall enable the user to open live video windows by using the mouse to drag a camera or group of cameras from the camera tree directly into the video window area of the application window.
  - b. The GUI shall enable users to view live video from multiple DVR units and sites simultaneously.
19. Controlling Live Video Windows
  - a. Live video windows shall be consistent with video playback windows in appearance and operation.
  - b. Live video windows shall maintain a cache of recent images. Enable the user to pause live video and quickly review recent images, then resume live video.

- B. System Monitoring and Problem Notification
  - 1. The DVRS shall monitor each system component, and generate system alert messages to notify system administrators of any component, and generate system alert messages to notify system administrators of any component that is not operating normally.
  - 2. Provide a normally open dry contact that closes when any alarm occurs to activate a "Trouble Alarm" at SCADA.
- C. Security: The DVRS shall include login security to control the following functions available to each system user:
  - 1. Grant and/or deny rights to individual users or groups of users.
  - 2. Restrict the ability to modify the system configuration.
- D. Additional System Integration Capabilities: The DVRS shall be a non-proprietary system providing an open system architecture with the capability of being integrated with other systems (Analog or Digital) through a variety of methods.
- E. Extendible GUI with Add-On Module Architecture: The DVRS GUI shall support an add-on module architecture that enables the DVRS Manufacturer to add custom windows and menu options without modifying or recompiling the GUI application code. The DVRS Manufacturer shall provide a software development kit that enables developers to create custom applications and web pages with seamlessly integrated digital video features.
- F. Advanced DVRS Functionality
  - 1. The DVRS shall provide a flexible platform framework to allow for expansion and enhancement as technology becomes available
  - 2. Advanced Outdoor Motion Detection: The DVRS shall have the ability to leverage Intelligent Motion detection providing the ability to discriminate against motion that is not of interest based on the following parameters:
    - a. Show motion, so the user can see all movement that the motion detection algorithm sees
    - b. Target size, minimum and maximum
    - c. Compensate for distance from the camera
    - d. Target speed, minimum and maximum
    - e. Length of time target has been in field of view

- f. Global change to compensate for events like a panning camera
  - g. Target minimum movement
  - h. Mask region
  - i. Support arbitrarily shaped masks
  - j. Contrast both global and local
  - k. Target aspect ratio
3. Web Based Video Retrieval: The DVRS shall support Web Based Video View or the Internet.

#### 2.04 DVRS HARDWARE SYSTEM CONFIGURATION REQUIREMENTS:

- A. The DVRS shall be configured to provide the specific hardware specifications outlined:
- 1. DVRS Master Communication Server Component: The DVRS shall incorporate an enterprise Master Communication Server component as an integral component to the system architecture. The Master Communication Server hosts Communication Server, which is a Windows XP based service used to control all of the data flow in the DVRS. The Master Communications Server shall be a redundant component offering two, hot-swappable power sources and two mirrored drives so that the SQL database maintaining the indexing schema for the DVRS' Video clips is protected. A Master Communications Server shall be used to track where each video clip resides in the system, synchronizes all DVR unit CPU time clocks, coordinates alarm responses, and manages recorder failover functions.
  - 2. IP Based Digital Video Appliances
    - a. The DVRS shall utilize Digital Video Appliances (DVA) to compress and digitize the composite Analog video signals generated by the cameras. The DVA's shall be able to support multiple frame rates (CIF and 4 CIF) and multiple quality settings (Low, Medium, and High) for maximum user flexibility. The DVA's shall have the flexibility to support multiple digital streaming speeds from 1 Fps to 15 Fps and utilize a M-JPEG-4 compression algorithm.
    - b. IP Based Digital Video Recorders shall minimally have 32 inputs, 900 GB Hard Drive storage; DVR shall provide resolution capability of 702x480 to 352x240. DVR shall be compatible with motion JPEG.

3. IP Based Digital Video Storage Recorders: The DVRS shall be configured to provide the specific software specifications outlined:
  - a. Recording rate and scheduling: The DVRS shall record all cameras at 5 FPS. The cameras can be defined as security cameras shall be initially configured for 16 hours per day, Monday through Saturday and switching to motion recording all other times. The other cameras are for process observation and no recording is required.
  - b. Alarming functionality: The DVRS shall be fully capable of supporting robust alarm sources and offers robust alarm responses to those sources. These capabilities include the following abilities for alarm sources:
    - (1) Alarm Inputs: Include DVR units or system components that accept alarm inputs from electrical devices. Inputs shall be configurable as normally open or normally closed.
    - (2) Video Activity Detection: DVR units capable of analyzing video images to detect activity. The absence of activity to correspond to the OFF state of the alarm source, and when activity is detected the state of the alarm source shall be ON.
      - (a) Provide a way to define the area(s) of interest for activity detection for a particular camera. The GUI to provide flexible drawing tools to enable the user to include and exclude multiple areas with rectangular or irregular shapes.
      - (b) Activity detection sensitivity to be configurable. When properly configured, the Network Digital Video Management System (NDVMS) to detect all legitimate activity while avoiding excessive false detection due to minor fluctuations in lighting or other insignificant changes in the video images.
    - (3) Video Loss Detection: DVR units to detect lost camera signals.
    - (4) Serial Alarm Interfaces: The NDVMS shall be able to receive messages from access control systems and other similar systems through serial communication interfaces. The NDVMS will interpret messages from the serial interface as state changes for one or more logical alarm contacts.
    - (5) Alarm Responses: Include a comprehensive feature set for responding to alarm messages.

- (a) Alarm Responses: Include a comprehensive feature set for responding to alarm messages.
  - (b) Send instructions to multiple devices and system components in response to any alarm message, regardless of the source of the alarm message.
  - (c) Base alarm source configurations and alarm responses on a schedule. The alarm source configuration and alarm responses to depend on the time of day and/or day of the week.
  - (d) Alarm response to consist of various types of instructions to be executed by the NDVMS in response to each alarm message that can be generated by an alarm source.
  - (e) Recording Instructions: Start recording or change the recording mode for one or more cameras connected to one or more recorders.
  - (f) Video Matrix Switcher Instructions: Call camera presets and call cameras to monitors for viewing live analog video associated with the alarm event.
  - (g) Relay Output Instructions: Control the state of one or more alarm relay outputs on DVRs or other system components.
  - (h) Alarm Display Instructions: Specify how alarms shall be shown on alarm monitoring stations, including the colors to be used to indicate the alarm urgency, any messages to be displayed, whether video shall automatically display on the alarm monitoring station, etc.
  - (i) Termination Instructions: This type of instruction causes other instructions to stop.
- c. Failover Recording Mode: The DVRS shall require 32 available inputs for failover recording for the system. The failover requirement shall allow the system to have redundancy for up to 32 total cameras in the event that a single or multiple DVR units does not cause a system outage.

- d. Camera Presets: The DVRS shall provide comprehensive features to take advantage of camera presets in the System Software. The GUI software shall support the following features:
- (1) Setting Up Camera Presets: Provide GUI functions to enable authorized users to view and modify camera preset definitions when the PTZ cameras and/or the video matrix switchers allow camera presets to be defined through a computer interface.
    - (a) Each preset to have a preset number and a description.
    - (b) Provide a button in the preset setup function to set the camera shot and a separate button to call the camera shot in order to verify that the preset is working properly.
    - (c) Allow user to designate one preset as the default preset, or to specify that autopan is the default. The NDVMS to return the camera to the default preset or autopan mode when a user finishes controlling a camera or when a task ends that specified a different preset.
  - (2) Access to Camera Presets when Viewing Live Video: Provide buttons and/or a dropdown list to select a camera preset when viewing live video (either on-screen or on an analog monitor controlled via the GUI). Interface to support selection of the autopan made.
  - (3) Using Camera Presets for Scheduled Recording: Enable user to specify the camera preset to be used when defining scheduled recording tasks. The NDVMS to call the camera preset automatically when initiating the scheduled recording task.
  - (4) Using Camera Presets for Alarm Recording: Enable user to specify the camera preset to be used when defining recording instructions as part of an alarm response. The NDVMS to call the camera preset automatically when initiating the alarm recording task.
  - (5) Prioritizing Camera Presets: The NDVMS to use task priorities to determine which camera preset shall be called when multiple tasks are requesting different presets for the same camera. If a higher priority task overrides the preset for a lower priority task, the lower priority task's preset restored when the higher priority task ends.
  - (6) Using Camera Presets Associated with Camera Groups: The NDVMS to enable authorized users to define group presets for

cameras. This is a camera preset that is called whenever the user drags and drops the group onto a monitor icon.

4. Camera Tours: The DVRS shall support robust camera tour functionality so that live viewing and monitoring of the site location is made easy for the surveillance staff. The DVRS software shall support the following set of features:
  - a. Provide GUI functions to enable authorized users to view and modify camera tour definitions.
    - (1) NDVMS allows for creation of multiple camera tours.
    - (2) Each camera tour has multiple numbers of cameras.
    - (3) Each camera can have an associated preset and dwell time.
    - (4) Dwell time can be set for all cameras in a camera tour in one operation.

## 2.05 CAMERAS

### A. High Resolution Color Camera

1. Manufacturer: Bosch Security Systems Model No. LTC – 0455/21.
2. General Requirements
  - a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN29001, QUALITY SYSTEM.
  - b. The manufacturer shall be ISO 14001 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.
  - c. This camera is designed for surveillance and industrial applications requiring a compact, rugged, 1/3-inch CCD camera meeting NTSC standards. .
  - d. The camera shall provide an On-Screen Display (OSD) for access to all camera features.
  - e. In addition to the normal color mode of operation, the camera shall provide a monochrome night mode operation utilizing Night Sense Technology that automatically activates under low light conditions. When in the night mode of operation the sensitivity of the camera shall be enhanced by a factor of 3.



- f. The camera shall accept fixed iris lenses, manual iris lenses, DC auto-iris lenses, and video-iris lenses. For ease of installation, the camera shall auto detect the type of lens used and optimize performance accordingly.
- g. The camera shall provide a lens wizard during lens back focus setup to allow focusing at maximum lens opening to ensure that the object of interest within the field of view always remains in focus.
- h. The camera shall provide through-the-lens automatic tracking white balance.
- i. The camera shall provide an automatic black level feature to enhance the contrast by removing veiling glare from the picture.
- j. The camera shall provide selectable on/off backlight compensation.
- k. The camera shall provide selectable auto/flicker less/off electronic.

### 3. Electrical Specifications

- a. When powered via 24 VAC or 120 VAC 60 Hz, the camera shall be synchronized to the power line zero crossing to ensure roll-free vertical interval video switching and recording. The vertical phase delay shall be adjustable from 0 to 358 degrees.
- b. Video output: Composite video 1.0 V p-p, 75 ohms.
- c. Sensitivity
  - (1) Color Mode
    - (a) Usable picture 030 IRE: 0.30 lux (0.03 foot-candle)
    - (b) Usable picture 50 IRE: 0.65 lux (0.07 foot-candle)
    - (c) Full video picture: 2.6 lux (0.26 foot-candle)
  - (2) Night Mode
    - (a) Usable picture 30 IRE: 0.12 lux (0.012 foot-candle)
    - (b) Usable picture 50 IRE: 0.26 lux (0.026 foot-candle)
    - (c) Full video picture: 1.04 lux (0.104 foot-candle)
- d. Rated Voltage and Range
  - (1) 12 VDC (10.8-39 VDC)
  - (2) 24 VAC, 60 Hz (12-28 VAC, 45-65 Hz)
  - (3) 120 VAC, 60 Hz (85-265 VAC, 45-65 Hz)

- e. Power consumption: 4 watts (without lens)
- f. Signal-to-noise ratio: 50 dB
- g. AGC: 21 dB, (max)

4. Mechanical Specifications

- a. Video Output: BNC
- b. Video/DC-Iris connector: 4-pin EIA-J
- c. Camera Mount: ¼ inch-20, top and bottom
- d. Lens mount: C and CS
- e. Weight: 0.99 lb. (0.45 kg)
- f. Dimensions (less lens/including connectors)

(1) 2.28 H x 2.6 W x 4.8 L inch (58 x 66 122mm)

- g. Power connections:

(1) 12 VDC and 24 VAC, 50 and 60 Hz models: Push type connectors.

(2) 120 VAC, 60 Hz models: 2-wire power cord with polarized plug.

5. Environmental Specifications

- a. Operating Temperature: -4 degrees F to + 122 degrees F. (-20 degrees C to + 50 degrees C).
- b. Operating humidity: 5% to 93% non-condensing.

6. Electromagnetic Compatibility

- a. EMC immunity: EN 50130-4
- b. EMC emission: EN505022 Class B, FCC, Class B, Part 15.

7. Cameras Lens: Provide the camera fitted with the following lens in accordance with the camera equipment schedule

- a. Bosch LTC 3364/40
  - (1) Focal Length: 2.8 – 10 mm
  - (2) Iris Range: f1.4 to 360
  - (3) Focus Range (MOD): 1 ft.
  - (4) Lens Mount: CS

- (5) Iris Control: 4-pin DC control
- (6) Focus control: manual

b. Bosch Model No. LTC 3374/20

- (1) Focal Length: 5 – 50 mm
- (2) Iris Range: f1.4 to 360
- (3) Focus Range (MOD): 3.3 ft.
- (4) Lens Mount: CS
- (5) Iris Control: 4-pin DC control
- (6) Focus control: manual

B. Weatherproof Color Cameras

1. General Requirements

- a. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN 29001, QUALITY SYSTEM.
- b. The camera system shall be a variable/high speed, domed camera consisting of an integral high resolution, CCD camera with zoom and an integral 360 (pan/tilt and integral receiver/driver) meeting NTSC Standards.
- c. Envirodome Housing: The camera system shall be provided with an NEMA 4 rated, heated weather-resistant dome bubble housing. Housing located outdoors shall be finished in dark bronze matching the lighting poles specified in Section 16511 – Lighting of the Electrical Contract.
- d. The camera system shall automatically switch from daylight color operation to nighttime monochrome operation when light levels decrease below a specified threshold level. Day/night operation may also be manually switched.
- e. The camera system's 360 (pan rotation shall be divided into 16 independent sectors with 16-character title per sector.)
- f. The camera system shall provide a function so that any or all of the 16 sectors may be blanked from the operator. In addition, a privacy masking feature shall be provided that allows creation of up to six (6) rectangular masks that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed.
- g. The camera address number shall settable via thumbwheel switches located within the camera.

- h. The camera system shall allow the storage of up to 99 preset scenes with each preset programmable for 16 character titles. A tour function shall be available to consecutively display each of the preset scenes for a programmed dwell time. Any or all of the presets may be included or excluded from the tour.
- i. The camera system shall be capable of recording two (2) separate tours of an operator's keyboard movements consisting of, tilt, and zoom activities for a total combined duration time of 15 minutes. Recorded tours can be continuously played back.
- j. When an operator stops manual control of the camera, and a programmed period of time is allowed to expire, the camera will execute one of the following programmable options:
  - (1) Return to preset #1
  - (2) Return to the automated tour previously executed
  - (3) Do nothing.
- k. The camera system shall ensure that any advanced commands required to program the camera are accessed via three levels of password protection ranging from low to high security.
- l. The camera system shall be designed so that an integral fiber optic transceiver module is available and capable of transmitting and receiving video and bi-phase signals up to 2.5 miles (4 km).
- m. The Camera system shall provide a feature that automatically rotates the camera to simplify tracking of a person walking directly under the camera.
- n. The camera shall be available in wall mount, mast (pole) mount, corner mount, and pipe mount versions, as the application requires.
- o. The dome bubble shall be available to meet stringent strength standards. The bubble shall be made of 3 mm thick polycarbonate and be able to withstand a 100 foot-pound impact or the equivalent of a 10 lb sledgehammer being dropped from a height of 10 feet.
- p. Electrical Specifications
  - (1) Main supply voltage, as required by the application
    - (a) 120 VAC, 60 Hz, 24 VAC, 60 Hz.
    - (b) Camera supply voltage; 21-28 VAC, 60 Hz.

## (c) Power: 50 watts total:

- 1) Camera power: 20 watts max
- 2) Heater power: 30 watts max

## q. Mechanical Specifications

- (1) Weight: 13 lb. (5.9 kg)
- (2) Pan/tilt: 360° continuous pan, -5° to 90° tilt from horizontal plane.

## r. Environmental Specifications

- (1) Humidity: 0% to 90% relative, non-condensing.
- (2) Operating Temperature: -40°C to +50° (-40°F to +122°F)
- (3) The housing shall be designed to meet NEMA-4 specifications.

## 2. Weatherproof PTZ Color Day/Night Camera with 18X zoom Specifications:

- a. Manufacturer: Bosch Security Systems Model No. ENV-D-120 -X-FT.
- b. Imager: 1/4-inch interline transfer CCD
- c. Video output: Composite video 1.0 V p-p, 75 ohms.
- d. Lens: 18x Optical Zoom (4.1 mm – 73.8mm); f1.4 to f3.0
- e. Field of View: 2.7 to 48 degrees
- f. Digital zoom: 12x
- g. Gain Control: Off/Auto with adjustable limits
- h. Synchronization: Line-lock (-120 to 120 vertical phase adjust) or internal crystal
- i. Aperture Correction: Horizontal and Vertical
- j. Sensitivity (usable video)
  - (1) Day mode w/slow shutter off: 0.025 foot-candle/0.25 lux
  - (2) Night mode w/slow shutter off: 0.0031 foot-candle/0.031 lux
  - (3) Day mode w/slow shutter on: 0.0016 foot-candle/0.016 lux
  - (4) Night mode w/slow shutter on: 0.0002 foot-candle/0.002 lux

- k. Signal to Noise Ratio: Greater than 50 dB.
  - l. Optical fiber compatibility: 50/125 mm, 62.5/125mm, low loss multimode glass fiber, rated for minimum system bandwidth of 20 MHz
3. Weatherproof PTZ Color Day/Night Camera with 26X zoom Specifications:
- a. Manufacturer: Bosch Security Systems Model No. ENV-E-120 -X-FT.
  - b. Imager: 1/4-inch Exview HAD CCD
  - c. Video output: Composite video 1.0 V p-p, 75 ohms.
  - d. Lens: 26x Optical Zoom (2.4 mm – 60mm); f1.6 to f2.7
  - e. Field of View: 2.3 to 55 degrees
  - f. Digital zoom: 12x
  - g. Gain Control: Off/Auto with adjustable limits
  - h. Synchronization: Line-lock (-120 to 120 vertical phase adjust) or internal crystal
  - i. Aperture Correction: Horizontal and Vertical
  - j. Sensitivity (usable video):
    - (1) Day mode w/slow shutter off: 0.33 lux
    - (2) Night mode w/slow shutter off: 0.025 foot-candle/0.25 lux
    - (3) Day mode w/slow shutter on: 0.013 foot-candle/0.13 lux
    - (4) Night mode w/slow shutter on: 0.0016 foot-candle/0.016 lux
  - k. Signal to Noise Ratio: Greater than 50 dB.
  - l. Optical fiber compatibility: 50/125 mm, 62.5/125mm, low loss multimode glass fiber, rated for minimum system bandwidth of 20 MHz

## 2.06 CAMERA HOUSING

### A. General

- 1. This product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN 29001, QUALITY SYSTEM.

2. The manufacturer shall be ISO 14001 Certified and adhere to an Environmental Management System that strives to reduce the impact its products and processes have on the environment.

**B. Indoor Ceiling Housing**

1. Manufacturer: Bosch Security Systems LTC 9369/00.
2. The indoor ceiling housing used for CCTV camera installations shall be mounted in fixed or suspended ceilings.
3. The housing specified shall be designed for use in environmental air spaces or in air handling plenums of non fire-resistant ceilings.
4. The housing specified shall be constructed of a tough 1.6 mm (0.06 in.) acrylic/PVC alloy plastic cover with window hinged to a 1 mm (0.04 in.) aluminized steel backbox.
5. The housing shall include key lock access to the camera.
6. The housing shall provide a two-piece adjustable camera mounting system.
7. The housing specified shall be mounted via eight protected 7 mm (0.27 in.) holes in the backbox. The top of the backbox shall contain two 6 mm (0.25 in.) knockouts to be used for safety cable wiring.
8. Mechanical specifications:
  - a. Weight: 3.4 kg (7.5 lbs)
  - b. Backbox size: 406 mm L x 191 mm W x 151 mm H (16 L x 7.5 W x 6 H in).
  - c. Window: 3.2 mm (0.13 in.) thick polycarbonate
  - d. Useable area: Accepts camera/lens combinations up to 330 L x 102 W x 102 H mm (13 x 4 x 4 in.)
  - e. Conduit Knockouts: Four PG13.5 (1/2 in.)

## 9. Environmental Specifications

- a. Enclosure Protection: Cover and window meet UL Flame Rating 94V-0
- b. Safety: UL
- c. EMC Requirements: FCC Class B, ICES-003

## C. Environmental Housing

- 1. Manufacturer: Bosch Security Systems TC 9346A-1
- 2. The environmental housing used for CCTV camera installations that are located either outdoor locations or indoors in process areas shall include a heater and blower.
- 3. The housing shall be constructed of aluminized and designed to accommodate large format CCD cameras.
- 4. The housing shall be finished in a gray polyester powder coat except for housing located outdoors shall be finished in dark bronze matching the lighting poles specified in Section 16511 - Lighting of the Electrical Contract.
- 5. The housing shall pad lockable.
- 6. Electrical specifications
  - a. Main supply voltage, as required by the application
    - (1) 120 VAC, 60 Hz, 24 VAC, 60 Hz.
    - (2) Camera supply voltage; 21-28 VAC, 60 Hz.
      - (a) Power: 105 watts total:
        - 1) Heater power: 90 watts max
        - 2) Blower power: 15 watts max
- 7. Mechanical Specifications
  - a. Weight: 8.15 kg (18 lbs)
  - b. Dimensions: 525.5 mm L x 267.9 mm W x 157.2 mm H (35.5 L x 10.5 W x 6.2 H in)



- c. Window: 6.35 mm (0.25 in.) thick glass 107.9 mm H x 133.3 mm W (4.25 H x 5.25 W in)
  - d. Latches: Four stainless steel side mounted latches that accept pad lock
  - e. Cable Entry: Two glands on bottom of housing
8. Environmental Specifications
- a. Humidity: 0% to 90% relative, non-condensing.
  - b. Operating Temperature: -23°C to +49° (-10°F to +120°F)
- D. Envirodome Housing
1. All Weatherproof Color Cameras are furnished in Envirodome Housing.
- 2.07 SERIES DIGITAL VIDEO SERVERS SERIES DIGITAL VIDEO SERVERS
- A. Digital Video Server
- 1. The digital video server (DVS) shall be an enterprise-class server using the MPEG-4 technology, and be capable of streaming video images from one camera input at 30 images per second (60 NTSC fields per second) under all conditions of motion in the image.
  - 2. The DVS shall be either a video transmitter compatible with NTSC cameras, or a video receiver offering a standard NTSC output.
  - 3. The DVS transmitter shall support dual encoded stream capability from a single video source to allow simultaneous and independent viewing and recording of live video at different frame rates and/or quality from the nDVR/nDVR Pro video management and storage software.
  - 4. The DVS shall comply with the VSIP Open Technical Framework for video services over IP, an open standard definition freely published by SmartSight Networks Inc. and Genetec Information systems Inc. and shall be fully compatible with nDVR.
  - 5. The DVS receiver shall be able to play live video streaming from a DVS transmitter or from nDVR on an analog monitor and shall display the time, date, camera title, and site name in text overlay. If the video being displayed originates from an event-triggered video stream, the DVS receiver shall display the alarm information.
  - 6. The DVS receiver shall be able to play back any recorded video stream originating from nDVR on an analog monitor (alternatively a VCR) with time, date, camera title, and site name in overlay. The DVS receiver shall be

able to accept start, stop, fast forward, and fast reverse commands from nDVR.

7. The DVS shall include pre/post-alarm video image capture capability. The DVS shall be capable to send the captured images to nDVR for log-term archiving. If the nDVR application is unreachable, the DVS shall be able to store the images locally in non-volatile memory.
8. The DVS firmware, including the video codec, shall be upgradeable remotely via Teinet or via the nDVR software.
9. The DVR shall support, as an option, bi-directional audio streaming with microphone or line-level input, and speaker or line-level output.
10. The DVS shall support an asynchronous serial port that can be programmed for data rates up to 23 kbps and can be set to RS-422 or RS-485 signal levels. The RS-485 mode shall support 2 wire and 4 wire interfaces.
11. The DVS shall support an RS-232 asynchronous serial port that can be programmed for data rated up to 230 kbps.
12. The DVS shall support three dry-contact inputs and one relay output.
13. The DVS shall not have a Windows operating system (OS) but instead operate from a real-time, embedded OS.
14. The DVS shall possess an internal watchdog to detect and recover from the unlikely occurrence of system lockup.
15. The DVS shall operate over a local area network (LAN) or the Internet, using a standard Ethernet 10/100 Base-T connection. The unit shall include support for DHCP and APIPA automatic IP configuration protocols. The unit shall also support Telnet remote management.
16. The DVS shall transmit or receive video using the UDP/IP unicast or UDP/IP multicast communication protocol. A return channel shall be available to implement error correction mechanisms and bandwidth throttling techniques in congested networks.
17. The DVS shall transmit all command and control messages using the TCP/IP protocol and use cryptographic keys based on the SSL V.3.0 protocol when communicating with nDVR, to prevent eavesdropping, tampering, or message forgery.

18. The DVS shall meet or exceed the following design and performance specifications:
- a. The pan-tilt zoom control latency shall be less than 125 ms, excluding network transmission latency.
  - b. The DVS shall support NTSV/PAL signal format with a programmable resolution from CIF format (352 x 240 pixels for NTSC) to 4CIF (704 x 480 pixels for NTSC).
  - c. The maximum bandwidth used by the DVS module shall be programmable from 32kbps to 4Mbps.
  - d. The average compressed image file size generated by the DVS recorder at CIF resolution shall be less than 1 kB when set for maximum compression and less than 2 kB when set for medium compression.
  - e. The DVS shall generate an alarm when the coaxial cable used between the unit and a camera is faulty or tampered with in any way that would cause loss of the video signal and/or if the camera is not operational.
  - f. The digital recorder shall provide an auto-sensing 10/100 Base-T RJ-45 LAN port.
  - g. The RS-232 port shall use a 9-PIN D type connector. The RS-422/485 port, digital input, and digital output shall use an industrial-type pluggable screw terminal block.
  - h. The DVS shall support both 12V AC and 12V DC power supply via an industrial pluggable screw terminal block and shall have a power consumption of less than 7 watts.
  - i. The DVS shall include an option for mounting of the unit in an EIA standard 19-inch rack. Up to 10 DVS shall fit in a single 4U high rack.
  - j. The DVS shall be enclosed in a compact and durable steel enclosure with size not exceeding 5.30L x 5.6W x 1.60H inches and shall be able to operate normally in an ambient temperature between 0 degrees C and 50 degrees C without using forced air cooling.
  - k. The DVS shall be designed to provide an MTBF of 100,000 hours and shall include ESD protection on all input and output signals.

## 2.08 NETWORK TERMINATING UNIT (NTU)

### A. Manufacturer: Verint Model No. Nextiva S1704E video server

1. Network terminating unit shall serve video from multiple analog signals and convert them to a high quality digital format that can be accessed for multiple computers.
2. The NTU should have a 10/100 Base-T Ethernet connection using a RJ-45 jack using the following protocols to transport signals: RTP/IP, UDP/IP, TCP/IP or Multicast IP.
3. The NTU video shall have 4 composites inputs, 1VPP into 75 ohms, (NTSC/PAL) though BNC Female connectors. It should be able to have scaleable resolution from 352-240 to 704 – 480 NTSC pixels.
4. The NTU shall have alarm contacts with 12 input dry contacts and 2 output relay contacts.
5. The NTU shall be powered from a 12V DC source.
6. The NTU shall be enclosed in a compact and durable steel enclosure with size not exceeding 17L x 6.1W x 1.7H inches and shall be able to operate normally in an ambient temperature between 0 degrees C and 50 degrees C without using forced air.

## 2.09 FIBER OPTIC TRANSCEIVERS/MULTIPLEXERS

### A. Manufacturer: Optelecom-NKF Electronics

### B. General: Contractor shall supply all components required for a fully operational system including mounting and housing hardware.

### C. Power supply Cabinet

1. The power supply cabinet shall be 19" 3HU rack mountable, while housing and powering eleven (11) single width NKF rack mount modules. Power supply cabinets shall have all connections on the front side of the cabinet. Cabinets shall have reversible mounting brackets to allow for connections to be concentrated at the front or rear of the rack. Cabinets shall have two (2) built in fans for efficient cooling. Main voltage of the power supply cabinets shall be 115 Vac with a frequency of 40-100 Hz. Maximum drop out time shall be 10ms, and power efficiency at full load shall be greater than 90%. Maximum DC output power shall be 165 Watts.

2. The operating temperature of the cabinet shall be -40 degrees C to +74 degrees C, and have dimensions of LxWxH 9.4" (23.8cm) x19.0" (48.2cm) x 5.1" (12.9cm).
3. Contractor shall supply all mounting hardware where racks are not used.
4. The power supply cabinet shall be NKF Electronic Model No. MC 11 AC-115.

D. Video Receiver/Data Transceiver

1. The video receiver/data transceiver shall receive one (1) unidirectional NTSC video signal at a 1 Vpp input level over one (1) multimode fiber. The receiver shall operate at the 850nm wavelength, and accept a minimum input power of -32dBm. The differential phase shall be less than 50, with a differential gain of less than 5%, incorporating adjustment free automatic gain control (AGC). The receiver shall also transport and receive a bi-directional data stream in the form of RS-422/485 protocols, while supporting full duplex, asynchronous, or serial transmission. The data transmission rate shall be DC to 64 kbit/s. The unit shall have one (1) 75-ohm BNC connector for video output and one (1) ST connector for optical video/data input. Data output connections shall be provided by two (2) 3-scre terminals, LED status indicators shall provide indication of DC power-on, data carrier present, and presence of video. The unit shall be environmentally hardened with an operating temperature of -40 degrees C to +74 degrees C, and be rack mount with dimensions (LxWxH) 7.5" (19.0cm) x1.4" (3.6cm) x5.0" (12.7cm), with a weight of 0.99 lbs (0.4kg).
2. The receiver shall be NKF Electronics model VDS 2210 RX.

E. MatchBox Video Transmitter/Data Transceiver

1. The video transmitter/data transceiver shall transmit one (1) unidirectional NTSC video signal at a 1 V p-p output level over one (1) multimode fiber. The transmitter shall operate at the 850/1300nm wavelength, with a minimum output power of -18dB. Bandwidth utilized shall be 8 MHz with a differential phase less than 50, and a differential gain of less than 5%, incorporating adjustment free automatic gain control (AGC). The transmitter shall also transmit and receive a bi-directional data stream in the form of RS-422/485 protocol, while supporting full duplex, asynchronous, or serial transmission. The data transmission rate shall be DC to 64kbit/s. The module shall have one (1) 75-ohm BNC connector for video input and one (1) ST connector for optical video/data output. Data input connector shall be provided by two (2) 3-screw terminals. LED status indicators shall provide indication of DC power-on and data carrier present. The unit shall be stand alone-matchbox format and powered by an external 12Vdc power source. The transmitter shall be environmentally hardened with an operating

temperature of -40 degrees C to +74 degrees C, and be dimensions (L x W x H) 3.5" (8.9cm) x 2.3" (5.8cm) x 1.3" (3.3cm), with a weight of 0.30 lbs (0.1kg).

2. The transmitter shall be NKF Electronics model VDS 2210 TX.

## 2.10 EQUIPMENT RACKS

- A. Manufacturer: Gorilla Systems 77" x 36" x 24" Server cabinet (coordinate final size requirements with final field equipment)
- B. General
  1. Racks shall be standard 23" mounting
  2. Interior power distribution for all equipment
  3. Adjustable shelving
  4. Cooling fans (sized for equipment use)

## 2.11 UPS

- A. General: Provide UPS with a minimum of 4 hours continuous running time for all digital video equipment meeting the requirements of Section 16264 - Uninterruptible Power Supplies.

## 2.12 NETWORK SWITCH

- A. Manufacturer: Cisco
- B. The Network Switch shall have the required number plus a minimum of (20) percent spare 10/100/1000 base-T ports to meet system requirements.

## 2.13 MASTER COMMUNICATIONS SERVER

- A. General
  1. The Communications Server controls all data flow.
  2. The Communications Server tracks where each video clip resides, synchronizes all CPU time clocks, coordinates alarm responses, and manages recorder fail over functions.
- B. Dedicated Server and Workstations: Provide Dedicated Server and workstations having following minimum features:

C. Dedicated Server

1. Processor: Dual Xeon, Dual Core CPU at 2.0GHz and 4MB cache, 1333 MHz FSB
2. Memory: 2GB of SDRAM
3. Monitor: 17-inch Rack mountable LCD
4. Hard Drive: 73GB 15K RPS SCSI hard drive
5. Network Card: Dual 10/ 100/ 1000 Ethernet Communication
6. 48X IDE CD-RW/DVD
7. Digital Tape Backup System
8. Pullout Keyboard and trackball
9. Graphics accelerator Card
10. Documentation: Provide all documentation, manuals and licenses
11. Safety/Regulatory: UL, FCC B, approved
12. Latest revision of software at time of bid required:
  - a. Windows XP Professional
  - b. Microsoft Office Professional
  - c. McAfee Virus Scan
13. Operator's Software: Provide access control system operator's software.

D. WorkStation

1. Processor: Dual Xeon, Dual Core at 1.6GHz and 4MB cache, 1066 MHZ FSB
2. Memory: 2GB of SDRAM
3. Monitor
  - a. LCD Type: 19-inch TFT active matrix
  - b. Video Input Signal: Analog RGB and digital DVI-D
  - c. Pixel Pitch: No greater than 0.294 mm
  - d. Viewing Angle: 85 degrees nominal
  - e. Contract Ratio: 600:1

- f. Brightness: 250 nits
  - g. Prime Mode: 1280 x 1024 (SXGA)
  - h. Mounting: VESA-compliant adapter plate)
- 4. Graphics accelerator card
- 5. Hard Drive: 80 GB minimum
- 6. Floppy Drive: 3.5", 1.44 MB diskette
- 7. CDRW: 48X
- 8. DVDRW: 4X minimum
- 9. Mouse: Microsoft Trackball Explorer
- 10. Network Card: 3 Com 3C905 Fast Etherlink XL 10/100 PCI Network Interface
- 11. Keyboard: 104+ keys
- 12. Documentation: Provide all documentation, manuals and licenses
- 13. Safety/Regulatory: UL, FCC B, approved
- 14. Latest revision of software at time of bid required:
  - a. Windows XP for workstations/ Microsoft Server for main server
  - b. Microsoft Office Professional
  - c. McAfee Virus Scan
- 15. Video Software Package: Verint review/playback software.

## 2.14 INDUSTRIAL MONITORS

### A. Manufacturer

- 1. Allen Badley Model No. 6186-M15SSTR
- 2. Vartech Systems Inc. Model No. VT150PSS with resistive touchscreen
- 3. Or approved equal

### B. Provide industrial monitors to allow viewing of specific camera locations. The industrial monitors that are UL Listed and shall have the following features:



1. Field monitors shall be a 15" stainless steel panel-mount LCD display, located in a NEMA 4X stainless steel enclosure.
  - a. LCD Type: 15-inch color TFT active matrix
  - b. Video Input Signal: Analog RGB and digital DVI-D
  - c. Contrast Ratio: 500:1
  - d. Brightness: 250 nits
  - e. Prime Mode: 1024 x 768
  - f. Anti reflective protective faceplate.
  - g. NTSC Ethernet, HD15/5BNC and coaxial cable input compatible.
  - h. Input Voltage: 120 V, 60Hz
  - i. Power Consumption: 24 W
  - j. Operational Temperature: 0°C to +50°C (32°F to +122°F)
  - k. Humidity: 10% to 90% relative, non-condensing.
  - l. Weight: (20 lbs)
  - m. Dimensions: 122 in H x 16.2 in W x 2.3 in D

## 2.15 RACEWAY SYSTEM

- A. A complete raceway system shall be provided for digital video systems in accordance with riser diagrams shown meeting the requirements of Section 16130 - Electrical Raceway Systems of the Electrical Contract.
- B. Empty conduits shall be provided with pull wire to facilitate pulling of cables.

## 2.16 CABLING

- A. Wire and cable meet the requirements for digital video system cable in Section 16121 - Wire and Cable - 600 Volts and below.
- B. Fiber optic cables meeting the requirements for digital video system cable in Section 16723 - Fiber Optic Cable.

## PART 3 DELIVERY, STORAGE, AND HANDLING

### 3.01 EXAMINATION

- A. Examine areas and conditions under which digital video system's conduit systems and plywood mounting panels are to be installed. Notify in writing conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

### 3.02 INSTALLATION

- A. General: Install digital video system as shown or required. Comply with requirements of the Electrical Code for the City of New York, NEC and local electrical codes.

- B. Pole Mounted Cameras: Coordinated mounting details for camera installed on lighting with lighting poles manufacture as specified in Section 16511 – Lighting of the Electrical Contract.
- C. Install conduit systems wiring, and plywood mounting panels as indicated and in accordance with the drawings and with recognized industry practices.
- D. Install system per the manufacturer's guidelines.
- E. Verify the operational compatibility and configuration requirements of all devices.
- F. Provide independent support from building structure for all devices.
- G. Submit typical mounting arrangement for all devices.

### 3.03 TESTING AND COMMISSIONING

- A. The supplier shall be responsible for final system hardware hook-up and checkout prior to commissioning the system to the end-user.

### 3.04 PROGRAMMING SERVICES

- A. Additional programming services shall be provided by the system manufacturer's representatives in the following areas:
  - 1. Database/importation
  - 2. Customized system programming
  - 3. Operational programming
  - 4. Custom report design/development generation
  - 5. Custom video badge design
  - 6. Graphical map design/development and test
  - 7. Camera naming
  - 8. CCTV camera call-up and recording features
  - 9. Alarm responses
  - 10. System database backup

### 3.05 SOFTWARE SUPPORT

- A. The manufacture shall supply all software upgrades and support for two (2) years after acceptance.

### 3.06 FIELD SERVICES

- A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the digital video system manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in Section 01820 - Training. Provide

all instruments and equipment necessary to conduct required tests, adjustments and training. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

- B. All equipment shall be tested for proper operation. Testing shall be observed by City for general compliance with the intended use.
- C. Training: Following completion of installation and field testing provide training for 12 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:
  - 1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
  - 2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

### 3.07 CLEANING AND REPAIR

- A. Contractor shall clean out and discard all materials used in the construction of their system.
- B. All damage caused under the installation of the Contractor systems shall be repaired to the original state by the Contractor.
- C. All repairs shall meet the City's satisfaction to be acceptable.

### 3.08 SCHEDULE OF CAMERA EQUIPMENT

- A. Abbreviations used in the schedule are as follows:

Service

S – Security

PO- Process Observation

Camera Types

HRCC - High Resolution Color Camera

WPCC – Weatherproof Color Camera

Housing Types

ICH - Indoor Ceiling Housing

ENH – Environmental Housing

EDH – Envirodome Housing

Camera Schedule North Shore Transfer Station						
CAMERA NUMBER	LOCATION	SERVICE	CAMERA TYPE	HOUSING TYPE	PAN TILT	LENS TYPE
C1	OUTDOOR	S	WPCC	EDH	Y	25X ZOOM
C2	OUTDOOR	S	WPCC	EDH	Y	25X ZOOM
C3	PERSONNEL AREA	S	HRCC	ICH	N	LTC3364/40
C4	PERSONNEL AREA	S	HRCC	ICH	N	LTC3364/40
C5	PERSONNEL AREA	S	HRCC	ICH	N	LTC3364/40
C6	PERSONNEL AREA	S	HRCC	ICH	N	LTC3374/20
C7	PERSONNEL AREA	S	HRCC	ICH	N	LTC3364/40
C8	LIDDING AREA (PIER)	S	HRCC	ENH	N	LTC3364/40
C9	LIDDING AREA (PIER)	S	HRCC	ENH	N	LTC3364/40
C10	OUTDOOR	S	WPCC	EDH	Y	25X ZOOM
C11	LIDDING AREA (OUTDOOR)	PO	HRCC	ENH	N	LTC3364/40
C12	LIDDING AREA (OUTDOOR)	PO	HRCC	ENH	N	LTC3364/40
C13	OUTDOOR	S	WPCC	EDH	Y	25X ZOOM
C14	OUTDOOR (ENTRANCE)	S	HRCC	ENH	N	LTC3364/40
C15	LIDDING AREA (LOADING)	PO	HRCC	ENH	N	LTC3364/40
C16	LIDDING AREA (LOADING)	PO	HRCC	ENH	N	LTC3364/40
C17	LIDDING AREA (LOADING)	PO	HRCC	ENH	N	LTC3364/40
C18	LIDDING AREA (LOADING)	PO	HRCC	ENH	N	LTC3364/40
C19	TIPPING ENTRANCE	S	HRCC	ENH	N	LTC3364/40
C20	TIPPING ENTRANCE	S	HRCC	ENH	N	LTC3364/40
C21	LOADING AREA (MEZZ)	PO	WPCC	EDH	Y	25X ZOOM
C22	LOADING AREA (MEZZ)	PO	WPCC	EDH	Y	25X ZOOM
C23	TIPPING LEVEL	PO	WPCC	EDH	Y	25X ZOOM
C24	TIPPING LEVEL	PO	WPCC	EDH	Y	25X ZOOM
C25	PIER GATE ENTRANCE	S	HRCC	ENH	N	LTC3364/40
C26	PARKING LOT	S	HRCC	ENH	N	LTC3364/40
C27	PARKING LOT	S	HRCC	ENH	N	LTC3364/40
C28	INBOUND SCALE	PO	HRCC	ENH	N	LTC3364/40
C29	OUTBOUND SCALE	PO	HRCC	ENH	N	LTC3364/40
C30	PARKING LOT ENTRANCE	S	HRCC	ENH	N	LTC3364/40
C31	OUTDOOR (BARGE)	PO	WPCC	EDH	Y	18X ZOOM
C32	OUTDOOR (BARGE)	PO	WPCC	EDH	Y	18X ZOOM
C33	OUTDOOR RAMP	S	HRCC	ENH	N	LTC3364/40

-END OF SECTION-

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**Section 17101**  
**SCADA SYSTEM - GENERAL REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, document and place in satisfactory operation a complete SCADA System as specified and as shown on the Contract Drawings. The system includes the following major equipment:

1. Operator workstations, consoles and printers
2. Control panels, operator interface terminals and programmable logic controllers (PLC)
3. Field instruments
4. System communication and interface equipment
5. Other appurtenances as specified

**1.02 RELATED SECTIONS**

- A. Section 16264 – Uninterruptible Power Supplies

**1.03 DESIGN REQUIREMENTS**

- A. The SCADA system shall be designed to monitor, store, display and log process and equipment operating information and alarms and to perform various process control functions and generate various reports. The unit processes which the SCADA system shall monitor and control are shown on the Drawings and described herein.
- B. The drawings and specifications illustrate and describe the overall SCADA system functional and operational requirements.
- C. Power Supplies
1. All electrically powered equipment and devices shall be suitable for operation on 115 volt  $\pm 10$  percent, 60 Hz  $\pm 2$  Hz power. If a different voltage or closer regulation are required, a suitable regulator or transformer shall be provided.
  2. Appropriate power supplies shall be furnished by Contractor for all two wire transmitters, loops for monitoring discrete inputs and all necessary outputs.

Power supplies shall be mounted in enclosures and installed in the appropriate Control Room or field panel.

3. Design all power supplies for a minimum of 130 percent of the maximum simultaneous current draw.
4. A power on-off switch or an air circuit breaker shall be furnished for each item requiring electrical power.
5. Provide isolation transformers, line voltage regulators and power distribution panels for the distributed digital portions of the SCADA system to eliminate electrical noise and/or transients entering on the primary power line.
6. Provide uninterruptible power supplies where shown, specified and required. Uninterruptible power supplies shall meet the requirements of Specification Section 16264 of the Electrical Contract.

#### D. Signal Requirements

##### 1. Analog Signals

- a. The control system shall be designed to use 4 to 20 mA<sub>dc</sub> analog signals, unless otherwise specified.
  - b. Signal converters and repeaters shall be provided where required. In addition, analog inputs to the SCADA system shall be through appropriate repeaters to provide signal isolation where series-looped with other devices and to allow the loop to maintain integrity even if the SCADA system is out of service. Power supplies shall be sized adequately for signal converter and repeater loads.
2. Signals shall be isolated from ground.
  3. Signals shall not have a transient dc voltage exceeding 300 volts over one millisecond nor a dc component over 300 volts.
  4. The system and associated input/output wiring will be used in a plant environment where there can be high energy ac fields, dc control pulses, and varying ground potentials between the sensors/transducers or input contact locations and the system components. The system design shall be adequate to provide proper protection against interferences from all such possible situations.

#### E. Miscellaneous

1. All instrumentation and SCADA system components shall be heavy duty types, suitable for continuous service in a municipal transfer station

environment. The system is to contain products of a single manufacturer, when possible, and to consist of equipment models which are currently in production. All equipment provided is to be of modular construction and to be capable of field expansion through the installation of plug-in circuit cards and additional cabinets as necessary. Design all logic and control loops to fail safe.

2. All instrumentation and SCADA system components shall be designed to return automatically to accurate measurement within 15 seconds upon restoration of power after a power failure or when transferred to a standby power supply.
3. Surge protection shall be provided for all instruments and all other control system components which could be damaged by electrical surges.
4. All field-mounted instruments and system components shall be designed for installation in humid and corrosive service conditions. All field mounted instrument enclosures, junction boxes and appurtenances shall conform to NEMA 4X requirements unless otherwise specified.
5. All relays with interconnections to field devices shall be wired through terminal blocks. Terminals as part of the relay base are not acceptable.
6. All panel-mounted instruments, switches, and other devices shall be selected and grouped for functionality and arranged to present a pleasing coordinated appearance. All front-of-panel-mounted devices shall be of the same manufacturer and model line.
7. All components furnished, including field and rear of panel instruments, shall be tagged with the item number and nomenclature indicated on the Contract Documents and/or approved Shop Drawings.
8. Ranges and scales specified herein shall be coordinated to suite equipment actually furnished.
9. Field-mounted devices shall be treated with an anti-fungus spray.
10. Where required, field-mounted devices shall be protected from exposure to freezing temperatures.
11. PLC, network, communication, and wireless network equipment, power supplies and other appurtenances provided under Division 17 shall be housed in enclosures as specified in Section 17320, located as shown, and meeting the environmental requirements specified elsewhere in this Section."



**F. Environmental Conditions**

1. The control system shall be designed and constructed for continuous operation under the following temperature and humidity conditions:
  - a. Control Rooms
    - (1) Air conditioned and heated
    - (2) Ambient Temperature: 60°F to 80°F normal range
    - (3) Relative Humidity: 40 to 60 percent normal range
  - b. Indoor heated locations
    - (1) Ambient Temperature: 40°F to 120°F
    - (2) Relative Humidity: 98 percent maximum
  - c. Unheated indoor locations: Similar to outdoor locations
  - d. Outdoor locations
    - (1) Ambient Temperature: -10°F to 120°F
    - (2) Relative Humidity: 100 percent maximum

**G. System Designs**

1. Range, scale and setpoint values specified or scheduled are for initial setting and configuration. Coordinate these values with actual equipment furnished to implement proper and stable process action as systems are placed in operation.
2. For any items where ranges, scales and setpoints may not have been specified, Contractor shall submit a recommendation to Commissioner for review.

**1.04 SUBMITTALS****A. Shop Drawings**

1. General
  - a. Working Drawing preparation shall not commence until after the pre-submittal conference specified below.
  - b. Manufacture of the SCADA system shall not commence until related submittals have been approved by Commissioner.
  - c. Shop Drawings shall be submitted in complete packages grouped to permit review of related items as generally outlined below.

## 2. Pre-Submittal Conference

- a. Contractor shall arrange and conduct a pre-submittal conference on the control system within 45 days of notification of preliminary acceptance of the proposed SCADA system and Supplier by Commissioner.
- b. Pre-submittal conference shall be attended by representatives of Contractor, City of New York, the SCADA system supplier, and Commissioner. Contractor shall allot one full working day for the conference.
- c. Purpose of the pre-submittal conference shall be to review informally and approve the manner in which the Supplier intends to respond to the Contract requirements before any submittals are prepared.
- d. Contractor shall prepare the items listed below for presentation at the pre-submittal conference. The information shall be submitted to Commissioner three weeks prior to the date of the conference.
  - (1) List of equipment and materials required for the control system and the brand and model which Contractor proposes to use for each item.
  - (2) List of proposed exceptions to the plans and specifications along with a brief explanation of each. Approval shall be subject to a formal submittal.
  - (3) Sample of each type of submittal specified herein. These may be submittals prepared for other projects.
  - (4) A flow chart showing the steps to be taken in preparing and coordinating each control system submittal to Commissioner, and a list of proposed submittals.
  - (5) Bar chart type schedule for all SCADA system related activities from the pre-submittal conference through start-up and training. Particular emphasis shall be given to dates relative to submittals, design, fabrication, programming, factory testing, deliveries, installation and field testing. The schedule shall be subdivided to show activities relative to each major item or group of items when everything in a given group is on the same schedule.
  - (6) General outline of the type of tests to be performed to verify that all sensors/transducers, instruments and digital processing equipment are functioning properly.

### 3. Submittal Requirements

a. Product information for all sensors/transducers and field and panel instruments. Include the following:

- (1) Manufacturer's product name and model number
- (2) Instrument tag number from Contract Documents
- (3) Manufacturer's standard catalog product data
- (4) Description of construction features
- (5) Performance and operation data
- (6) Installation and mounting details, instructions and recommendations
- (7) Service requirements
- (8) Dimensions

b. SCADA System Information:

(1) System Description:

- (a) Detailed block diagram showing system hardware configuration and identifying model numbers of system components
- (b) Software language and organization
- (c) Format, protocol and procedures for data highway communications and local communications with input/output modules and peripheral devices
- (d) Human-machine interfacing (HMI) details
- (e) Control and failure modes
- (f) On-line and off-line capabilities for programming, system utilities and diagnostics
- (g) Input/Output point listing with I/O module cross reference identification for each I/O location
- (h) Data base listing including all input/output points

- (i) Suggested detailed format and configuration of all log reports, alarm summaries, printer outputs, CRT displays and graphics
  - (j) List of spare parts and test equipment
- (2) Equipment Hardware
- (a) Layout drawings showing front, rear, end and plan views to scale of all processing equipment, I/O components, power supplies and peripheral devices
  - (b) Construction details, features and procedures
  - (c) Interconnection diagrams including termination details, cable identification list and cable length
  - (d) Plans showing equipment layout in control panels
  - (e) Installation requirements, instructions and/or recommendations
- (3) Software Description
- (a) Standard technical documentation covering all aspects of the distributed control system software functions and capabilities, including instruction set description and programming procedures related to control, monitoring, display, logging, reporting and alarming functions
  - (b) Standard technical and instructional documentation covering software for utility, system support, system documentation, display, communications, data logging and storage and diagnostic functions
  - (c) Detailed functional descriptions of application programs explaining control, display, logging and alarming features to be provided and functions to be performed
  - (d) Documentation describing memory type, size and structure and listing size of system memory, I/O and Data Table memory and size of memory available for control programs. Also define estimated control program memory requirements and processor execution times and program scan times.
  - (e) Documentation describing central monitoring station main and secondary memory types size and requirements to

perform the display, logging, reporting and alarming functions required

c. Panels, Consoles and Cabinets Information

(1) Layout Drawings, include the following:

- (a) Front, rear, end and plan views to scale
- (b) Dimensional information
- (c) Tag number and functional name of components mounted in and on panel, console or cabinet
- (d) Product information on all panel components
- (e) Nameplate location and legend including text, letter size and colors to be used
- (f) Location of anchoring connections and holes
- (g) Location of external wiring and/or piping connections
- (h) Mounting, support and installation details
- (i) Proposed layouts and sizes of graphic display panels
- (j) Calculations for heating and cooling

(2) Wiring and/or piping diagrams, include the following:

- (a) Name of panel, console or cabinet
- (b) Wiring sizes and types
- (c) Piping sizes and types
- (d) Terminal strip numbers
- (e) Color coding
- (f) Functional name and manufacturer's designation for components to which wiring and piping are connected

(3) Electrical control schematics in accordance with JIC standards

(4) Plan showing equipment layout in each area

- d. Where included, field piping diagrams, include the following:
  - (1) Piping sizes and types
  - (2) Location, functional name and manufacturer's designation of items to which piping is connected
- e. Instrument loop diagrams for all analog and digital display, control and I/O loops prepared using ISA standard symbols in accordance with ISA standard S5.4, include the following:
  - (1) Instrument tag numbers from Contract Documents
  - (2) Functional name of each item
  - (3) Manufacturer's model, product, or catalog number for each item
  - (4) Location of each item
  - (5) Software references for all points
- f. SCADA System I/O Loop Wiring Diagrams: Prepare drawings on a module-by-module basis and include the following information:
  - (1) Rack numbers, slot number, module type and module terminal point numbers. Also include location and identification of all intermediate panel terminal block and strip numbers to which I/O wiring and power supply wiring is connected. Identify all power supply circuit numbers and ratings.
  - (2) Wiring sizes, types, wire numbers and color coding
  - (3) Location, functional name, tag numbers and manufacturer model numbers of panel and field devices and instruments to which I/O wiring is connected. For discrete I/O devices use JIC electrical symbols tagged with designation shown on the Contract Documents.
- g. System Software Documentation: Prepare and submit two copies of preliminary software documentation at least four weeks prior to expected initiation of factory testing. Submittal shall be for City of New York and Commissioner information only and shall not be subject to formal approval. Software documentation shall include the following as a minimum:
  - (1) Complete hard copies of all ladder diagram programming. Documentation shall include complete external and internal I/O coil, contact and signal cross referencing, addressing and rung numbering. Documentation shall clearly distinguish between internal and real I/O and shall also incorporate extensive English language to identify all contact, coil and signal functions and for

labeling and description of program, sub-program and rung purpose and action.

- (2) Complete listing of external and internal I/O address assignments, register assignments and present constant values along with functional point descriptions. Also list all unused/undefined I/O and data table registers available.
- (3) Complete hard copies of all program documentation for all types of programs.
- (4) Detailed system memory map defining memory segments used and spare memory segments available for system memory, I/O tables, Data Tables and control program.
- (5) Complete database listing including listings for log, report and alarm file setups.
- (6) Hard copies of all system graphic displays and formats for all logs, reports and the alarm summary.
- (7) User's manuals describing procedures and providing examples for use of operator's consoles, workstations and programming terminal, accessories and system utility routines to perform control, display and logging program generation, program modification, program verification, diagnostics, program documentation, loading and backup and other required system support functions.
- (8) Graphic Displays: Submit samples of each type of display including proposed colors to be used for process equipment and piping.

**B. Control System Operation and Maintenance Manuals**

1. Furnish O&M manuals for the SCADA System in accordance with Section 01831 - Operation and Maintenance Manuals, and the supplemental requirements below:
2. The O&M manuals shall include the following:
  - a. Name, address and telephone number of the Supplier's local service representative
  - b. Complete list of supplied system hardware parts with full model numbers referred to system part designations, including spare parts and test equipment provided

- c. Copy of all approved submittal information and system shop drawings as specified herein with corrections made to reflect actual system as tested and delivered to the site for installation. Half-size black line reproductions shall be provided for all working drawings larger than 11 by 17 inches.
- d. Complete up-to-date system software documentation
- e. Manufacturer's original copies of hardware, software and installation, assembly and operations manuals for the SCADA system devices, and all other control system components. Manuals shall include the following information:
  - (1) General descriptive information covering the basic features of the equipment
  - (2) Physical description covering layout and installation requirements and all environmental constraints
  - (3) Functional and operational descriptions covering the procedures for programming, operation, start-up, shutdown, and calibration of the SCADA system equipment and explaining how the various control functions are performed
  - (4) Principles of operation explaining the logic of operation; provide information covering operation to a component level
  - (5) Maintenance procedures covering checkout, trouble-shooting, and servicing; checkout procedures shall provide the means to verify the satisfactory operation of equipment, trouble-shooting procedures shall serve as a guide in determining faulty components and servicing procedure shall cover requirements and recommended time schedule for calibration, cleaning, lubrication and other housekeeping and preventive maintenance procedures.
  - (6) Wiring, schematic and logic diagrams
  - (7) Safety considerations relating to operation and maintenance procedures

C. Record Drawings and Documentation

- 1. Contractor and Supplier shall revise all system working drawings, submittals and software documentation to reflect as-built conditions in accordance with the requirements of the Contract Documents and the supplemental requirements below.



2. Fourteen copies of all revised working drawings and documentation shall be submitted to the Commissioner to replace out-dated drawings and documentation contained in the System O&M Manuals per Section 01831 - Operation and Maintenance Manuals. Half-size black line sets shall be provided for all drawings larger than 11x17. Specific instructions for out-dated drawing removal and replacement shall be provided with the record drawing submittal.
  3. Half-size black line prints of wiring diagrams and any program or configuration printouts applicable to each control panel shall be placed inside a clear plastic envelope and stored in a suitable print pocket or container inside each control panel.
- D. Reports: Fourteen copies of the following reports shall be submitted to Commissioner.
1. Factory Test Procedures and Reports as described in Article 2.01 of this section
  2. Installation Inspection, Field Calibration, and Field Testing Reports as specified in Article 3.01 of this section
  3. Training plan as described in Article 3.02 of this section

## 1.05 QUALITY ASSURANCE

### A. General

1. The SCADA system shall be furnished by a single Supplier who shall assume responsibility for providing a complete and integrated system.
2. All equipment, components and materials required shall be furnished by the single Supplier who shall assume the responsibility for adequacy and performance of all items.
3. The Supplier shall identify those system components that are not of his manufacture.
4. The Supplier shall supply his company's quality assurance plan and for components which are not of his manufacture, the component manufacturer's quality assurance plan. The plans shall include, but not necessarily be limited to, method of construction and testing, raw material criteria, methods of documentation, station control, "Burn-In", final tests and serialization coding and packaging. Said plans shall be in accordance with M.I.L.-105D.

**B. Supplier's Qualifications**

1. Supplier shall be a financially sound firm having at least three years continuous experience in designing, implementing, supplying and supporting instrumentation and control systems at municipal facilities which are comparable to the SCADA system in terms of hardware, software, cost and complexity.
2. Supplier shall have manufactured and supported standard lines of similar processing and control equipment and application software continuously for the last three years.
3. Supplier shall have in existence, at the time of bid advertisement, an experienced engineering and technical staff capable of designing, implementing, supplying and supporting the SCADA system and handling the SCADA system submittal and training requirements.
4. Supplier shall provide system hardware components and software packages of fully developed, field proven standardized designs and therefore shall furnish a system that is not a highly unique, custom, one-of-a-kind system.
5. Supplier shall have a minimum of two years experience in operator interface software configuration and hardware application and programming of programmable logic controllers and data highway systems.
6. Supplier shall provide standard course offerings in general process control applications and in operation, programming and maintenance of the control system and equipment at a facility specifically utilized for training purposes. The facility shall have been in operation continuously for the last two years.
7. Supplier shall have a system of traceability of the manufactured units and purchased components through production, assembly and testing.
8. Supplier shall have a system of "Burn-In" for all components and available supportive documentation.
9. Supplier shall have a demonstrated record of prompt response to field failures.
10. Supplier shall have a documented program of failure analysis.
11. Supplier shall have a UL approved panel shop.
12. Supplier shall have a record of prompt shipments in accordance with contract obligations required for previous projects.

- C. Technical Proposal Requirements: The Contractor shall submit a copy of a Technical Proposal from the supplier which he has selected to provide the SCADA

system. The proposal shall be complete and contain all information as specified below.

1. Financial Statement: Include the value of distributed microprocessor based control systems delivered during the last two fiscal years. Also include the value of other process instrumentation and controls shipped during the period.
2. Experience
  - a. Provide evidence of compliance with the specific experience requirements listed in Paragraph 1.05.B. above in the form of an experience certification signed by an officer of the company.
  - b. Describe at least three completed municipal projects utilizing instrumentation and control equipment identical to or similar to (indicate which) that specified. Indicate project name, value, completion date, names and phone numbers of project representatives familiar with each project. Letters of recommendation may be submitted.
  - c. Furnish list of last three projects completed.
3. Personnel: Provide a listing of those personnel committed to be assigned to the project. List shall include project manager, project engineer, field representative, local service representative, and sales representative. Indicate addresses of personnel not based at supplier's main office. Provide documentation including resumes of personnel demonstrating experience.
4. Exceptions: List all exceptions and deviations from the requirements of these Specifications and/or the Contract Drawings. Reference section number, article, and paragraph of proposed variance and provide an explanation of why and how the proposed substitution meets or exceeds the functional or equipment requirements specified.
5. Shipment Records: Provide evidence of timely delivery of equipment on past projects.
6. SCADA System Hardware and Software
  - a. Provide a general system configuration drawing and include designations for model numbers and types of the proposed SCADA system and all other proposed system components.
  - b. Provide descriptive literature and manufacturer's catalog information covering all aspects of the hardware design and software functions and capabilities of the specific control system and data highway system proposed for the SCADA system.

## 7. Hardware and Software

- a. Provide descriptive literature and catalog information covering the features and capabilities of all proposed hardware components.
- b. Describe standard software packages proposed, including any customized software required to meet the functional intent of the system specifications. Descriptions shall address the following:
  - (1) Overview of system software including the functions, organization and interrelationship of the major software modules provided
  - (2) Estimated memory requirements to accomplish the specified graphic display, logging, reporting and alarming functional requirements
  - (3) Examples of graphic displays, methods of display access and procedures for display definition and generation, including use of the standard symbols library and capabilities for generating and storing user defined symbols in the symbol library
  - (4) Real-time data logging and reporting software features and capabilities including examples of logs and reports, procedures for automatic reporting and logging file setups, limitations on sampling and computing frequency for data acquisition and logging, and utilities for log file and report modifications and file maintenance
  - (5) Alarm handling software features and capabilities including an alarm display example, methods of defining alarms and alarm files, automatic printing of alarms, acknowledgements and return to normal conditions, chronological sorting and time-tagging of alarms, and alarm file maintenance utilities
  - (6) System programming and documentation software features and capabilities, including screen display and printout examples for a fully annotated and cross-referenced ladder diagram and the ladder diagram elements
  - (7) Use of system level diagnostics for monitoring the performance of and detecting and reporting faults associated with the distributed communications data highway

8. Instrumentation and Panel Mounted Devices: Provide descriptive literature and catalog cuts for each type of sensor, transmitter, indicator, and other such devices required by the project.

9. Training: Provide information and literature as to the organization proposed and the factory facilities to be utilized for the training specified. Indicate the qualifications of the factory training staff.
10. Availability Demonstration: Indicate how the Availability Demonstration will be accomplished.
11. Maintenance: Provide the following information:
  - a. Location of service facility along with minimum and maximum response time
  - b. Location of parts facility with delivery time and method

D. Supplier's Responsibility

1. Contractor shall retain the SCADA system Supplier to assume the responsibilities specified below. However, execution of these specified duties by the Supplier shall not relieve Contractor of ultimate responsibility for the SCADA system.
  - a. Design, fabrication, implementation and applications programming of the SCADA system and all subsystems in accordance with the Contract Documents and all referenced standards and codes
  - b. Preparation, assembly and correction of all SCADA system submittals in accordance with the Contract Documents
  - c. Proper interfacing of the SCADA system hardware, software, field devices and panels, including required interfacing with packaged control systems furnished by other equipment suppliers, and with the plant electrical system
  - d. Supervision of the installation of SCADA system, instruments, panels, consoles, cabinets, wiring and other components required
  - e. Calibration, testing and start-up of the SCADA system
  - f. Training of City of New York personnel in operation and maintenance of the SCADA system
  - g. Handling of all warranty obligations for the controls system components
  - h. Maintenance of two reproducible copies of the complete system and running software at the supplier's facility for the duration of the warranty period. Software copies shall be maintained on the bulk storage medium

used by the supplier for system program development and shall be directly loadable on the supplied system.

E. Coordination and Progress Meetings

1. Contractor shall be responsible for the scheduling and coordination of the system installation with regard to all other work on the site and in accordance with the provisions of the Contract Documents. Said coordination shall be documented on the project schedule. The purpose of the meetings shall be to review the progress of the Work involving the SCADA system and provide coordination for installation of the equipment to ensure construction schedules are met.
2. Routine progress and coordination meetings will be scheduled by Commissioner. Contractor and a representative of the Supplier shall be required to attend a minimum of one meeting per month for the length of contract.
3. Representatives at the meetings shall have the competence and authority to make any and all necessary decisions. Decisions and statements made at the meetings shall commit Contractor and Supplier to agreed procedures and schedules.

F. System Supplier Project Personnel: Contractor shall require the Supplier to provide the following project personnel:

1. Project Manager
  - a. The Supplier shall appoint a project manager who shall coordinate and schedule all work and assure that project schedule is met.
  - b. The project manager shall act as the liaison with Contractor for the installation of the monitoring and control system equipment and shall assist in all matters required for proper coordination and interfacing of the equipment and processes.
2. Field Engineer
  - a. The Supplier shall appoint a Field Engineer with responsibilities as follows:
    - (1) Provide advice and technical consultation relative to installation techniques and procedures for equipment furnished.
    - (2) Installation, system checkout, calibration, adjustment and start-up including tuning of every control loop.

- (3) Maintenance services during availability demonstration.
- (4) Involvement in the on-site system training of plant personnel.
- (5) Resolving of control problems encountered during initial start-up and testing of all plant monitoring and control equipment.

b. The field engineer shall have a minimum of three years experience in systems engineering and start-up and shall have a thorough working knowledge of both the hardware and software supplied for the SCADA system.

3. Training personnel as described in Article 3.02 of this section.

#### 1.06 REFERENCE STANDARDS

A. The following organizations' standards shall be used as guides in assuring quality and reliability of components and systems; govern nomenclature; define parameters of configuration and construction, in addition to specific requirements of the Specifications and Contract Drawings:

- 1. ISA, Instrument Society of America
- 2. API, American Petroleum Institute
- 3. UL, Underwriters' Laboratories, Inc.
- 4. NRC, Nuclear Regulatory Commission
- 5. NEMA, National Electrical Manufacturers Association
- 6. OSHA, Occupational Safety and Health Administration
- 7. ANSI, American National Standards Institute
- 8. MIL, Military Standards
- 9. NFPA, National Fire Protection Association
- 10. SAMA, Scientific Apparatus Manufacturers Association
- 11. JIC, Joint Industrial Council
- 12. IEEE, Institute of Electrical and Electronic Engineers
- 13. NEC, National Electrical Code
- 14. FM, Factory Mutual

#### 1.07 EQUIPMENT DELIVERY, HANDLING AND STORAGE

A. The SCADA system shall be packaged at the factory prior to shipment to protect each item from damage during shipment and storage. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment. Keep City of New York and Commissioner informed of equipment delivery.

B. Transportation and handling of the SCADA system equipment and appurtenances shall comply with the requirements of Section 01651 - Transportation and Handling

of Materials and Equipment, requirements of the Supplier, and requirements of equipment manufacturers.

- C. Protection of SCADA system materials and equipment shall comply with the requirements of Section 01661 - Protection of Materials and Equipment and with manufacturer's instructions and relevant organization standards. Supplier shall notify Contractor in writing (with copies to City of New York and Commissioner) of the storage requirements and recommendations for the equipment prior to shipment.

## PART 2 PRODUCTS

### 2.01 FACTORY TESTING

- A. Factory testing shall be in accordance with Section 01431, Quality Assurance Inspection.
- B. General Requirements
  - 1. Factory testing shall be performed before shipment at the manufacturer's facility to verify that system components are functioning properly and that they meet the functional and performance requirements of the Contract Documents.
  - 2. Contractor shall submit information on factory testing procedures to verify that testing shall fulfill the requirements as specified herein. Submittal shall be made at least two months in advance of any scheduled testing and shall include dates of scheduled tests.
  - 3. Contractor shall notify Commissioner in writing at least 45 days before expected initiation of tests. City of New York and Commissioner shall be present at Contractor's facilities during operational test of system equipment, either for individual units or as an integrated system. Presence of City of New York and Commissioner during testing does not relieve Contractor from conforming to the requirements of the Contract Documents and shall in no way imply acceptance of the equipment.
  - 4. If the need should arise to retest the system or any part thereof and witnessing is deemed necessary, the Contractor shall be responsible for the same associated costs as aforementioned plus the additional costs of the City of New York's and Commissioner's staff members' time.
  - 5. When the factory tests have been successfully completed, a report shall be submitted to the Commissioner. The equipment shall not be shipped until Notice of Acceptance of the test is received by the Contractor.



C. All panels, consoles and cabinets shall be inspected. Inspection shall include, but not be limited to the following:

1. Nameplates and tags
2. Wire sizes and color coding
3. Terminal block contact ratings and numbers
4. Terminal block spares
5. Proper wiring practices and grounding
6. Enclosure flatness, finish and color

D. System Hardware Operational Testing

1. All input/output devices and components shall be tested to verify operability and basic calibration.
2. All system hardware components equipment shall be tested to verify proper operation of the equipment as stand alone units. Test shall include, but not be limited to, the following:
  - a. AC/DC power checks
  - b. Power fail/restart tests
  - c. Diagnostics checks
  - d. Test demonstrating that all specified equipment functional capabilities are working properly.
3. All system components shall be tested to verify that communication between units is working properly.
4. An integrated system test with all system equipment connected (excluding field sensors and instruments) shall be performed to verify that all equipment is performing properly as an integrated system.

E. System Software Demonstration

1. Contractor shall demonstrate all system software utility and security programs incorporated into the system to illustrate the various functions and capabilities specified.
2. Contractor shall demonstrate the operation and display of all software based on a simulation of 5 percent of total input/output count, both analog and discrete, as selected by the manufacturer. In addition, City of New York/Commissioner shall randomly select, at the time of the test, additional inputs and outputs to be simulated in an amount approximately equal to 5 percent of total input/output count. Demonstration shall show that the

monitoring and control application software associated with the input/output points performs the functions intended.

3. System performance shall be tested using a fully integrated system, including all software and hardware if applicable. To achieve this, the entire control system, including all the peripheral devices and all interconnecting cables, shall be assembled on the factory test floor and simulated inputs applied. The Contractor shall carry out a full system test, during which the entire system shall operate continuously without failure in accordance with the requirements of the Specifications and Drawings.
4. Contractor shall provide process I/O simulation panel prior to the test:
  - a. Toggle switches to simulate field or other input contacts
  - b. Indicating lights to simulate outputs from tested panels
  - c. Control relays to simulate MCC coil inputs
  - d. Time relays to simulate position switches
  - e. Indicators (mA) to indicate every 4-20 mA output from tested panel
  - f. Potentiometers to simulate 4-20 mA inputs to tested panel
5. Every device shall have nameplate with description and device's tag number. Nameplates shall be removable and interchangeable for multiple use of panel during the test.
6. Demonstration of communication between PLC's or remote I/O's shall be included in the Test Procedure where applicable.
7. Operator Interfaces: Prior to the staging and testing of the system, the display environments shall have been configured per the agreed upon display structure, loaded and data base parameters linked to the specified fields. During this phase of the factory acceptance test, the overall display structure shall be demonstrated, including environment configurations, passwords, security, etc. The memo display contents shall be reviewed to demonstrate how an operator navigates within the overall display structure. The assignment of displays to annunciator keys shall also be demonstrated. Each graphic display shall be reviewed for correctness in terms of the layout, symbols, color scheme, etc. The operation of standard alarm management displays (Current Alarm Display, Alarm History, etc.) shall also be demonstrated. A demonstration of each type of report specified shall be performed. Printing shall be an integral part of the report demonstration.

### PART 3 EXECUTION

#### 3.01 SYSTEM START-UP AND FIELD TESTING

- A. The Contractor shall retain the services of the Supplier to supervise and/or perform check-out and start-up of all system components. As part of these services, the

Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

**B. System Checkout and Start-up**

1. The Contractor, under the supervision of the SCADA system Supplier, and other instrument suppliers as applicable, shall perform the following:
  - a. Check and approve the installation of all SCADA system components and all cable and wiring connections between the various system components prior to placing the various processes and equipment into operation.
  - b. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. When there are future operational functions included in this work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up of the various unit processes.
2. The Contractor shall provide all test equipment necessary to perform the testing during system checkout and start-up.
3. The Contractor and Supplier shall be responsible for initial operation of SCADA system and shall make any required changes, adjustment or replacements for operation, monitoring and control of the various processes and equipment necessary to perform the functions intended.
4. The Contractor shall furnish to the Commissioner certified calibration reports for field instruments and devices and panel mounted devices as soon as calibration is completed.
5. The Contractor shall furnish the Commissioner an installation inspection report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by authorized representatives of both Contractor and the Supplier.

**C. Integrated System Field Test**

1. Following the SCADA system checkout and initial operation, the Contractor, under the supervision of the supplier, shall perform a complete system test to verify that all equipment and programmed software is operating properly as a fully integrated system, and that the intended monitoring and control functions

are fully implemented and operational. Any defects or problems found during the test shall be corrected by Contractor and then retested to demonstrate proper operation.

2. Following demonstration of all system functions, the SCADA system including field sensors/transducers and instruments shall be running and fully operational for a continuous 48 hour period. The Operational Availability Demonstration specified below shall not begin until the continuous 48 hours integrated system test has been successfully completed and City of New York and Commissioner agree that the Operation Availability Demonstration can begin.

#### D. Operational Availability Demonstration

1. Operational Availability Demonstration (OAD) shall begin following completion of the integrated system field test as specified above and shall continue until a time frame has been achieved wherein the system (both hardware and software) availability meets or exceeds 99.9 percent for 60 consecutive days and no system failures have occurred which result in starting the OAD over again. During the OAD the system shall be available to plant operating personnel for use in normal operation of the plant.
2. For the purpose of the OAD the system will be defined as consisting of all operator interfaces and connected PLC's.
3. The conditions listed below shall constitute system failures which are considered critical to the operability and maintainability of the system. The OAD shall be terminated if one or more of these conditions occur. Following correction of the problem, a new 60 consecutive day OAD shall begin.
  - a. Failure to repair a hardware or software problem within 120 consecutive hours from the time of notification of a system failure.
  - b. Recurrent hardware or software problems: if the same type of problem occurs three times or more.
  - c. Software problem causing a processor to halt execution.
4. The following conditions shall constitute a system failure in determining the system availability based on the equation specified in Paragraph 3.01D.5:
  - a. Failure of any operator interface or PLC.
  - b. Loss of communications between devices on the communications network.
  - c. Failure of one or more input/output components.

- d. Failures of any type affecting ten or more input/output points simultaneously.
  - e. Failure of any type affecting one or more regulatory control loops or sequential control strategies thereby causing a loss of the automatic control of the process variable or process sequence operation.
  - f. Failure of power supply. Where redundant power supplies are provided, failure of one power supply shall not constitute a system failure provided the backup power supply operates properly and maintains supply power. Failure of the backup supply to operate properly and maintain supply power shall constitute a system failure.
  - g. Failure of three or more primary sensors/transducers or field instruments simultaneously.
5. The system availability shall be calculated based on the following equation:

$$A = \frac{TTO}{TTO + TTR} \times 100\%$$

Where:

A = system availability in percent  
TTO = total time in operation  
TTR = total time to repair

6. Time to repair shall be the period between the time that Contractor is notified of a system failure and the time that the system has been restored to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period.
- a. Actual travel time for service personnel to get to the plant site up to 6 hours per incident from the time Contractor is notified of a system failure.
  - b. Time for receipt of spare parts to the plant site once requested up to 24 hours per incident. No work shall be done on the system while waiting for delivery of spare parts.
  - c. Dead time shall not be counted as part of the system available period. The dead time shall be logged and the duration of the OAD extended for an amount of time equal to the total dead time.
7. Completion of a 60 consecutive day period without any restarts of the OAD and with system availability in excess of 99.9 percent will constitute acceptance of the SCADA system by Commissioner.

8. All parts and maintenance materials required to repair the system prior to completion of the OAD shall be supplied by Contractor at no additional cost to City of New York. If parts are obtained from the required plant spare parts inventory, they shall be replaced to provide a full complement of parts as specified.
9. A SCADA System Malfunction/Repair Reporting Form shall be completed by the plant personnel and Commissioner to document system failures, to record Contractor notification, arrival and repair times and Contractor repair actions. Format of the form shall be developed and agreed upon prior to the start of the OAD.

### 3.02 TRAINING

#### A. General Requirements

1. The Contractor shall retain the services of the System Supplier to provide operation and maintenance training for all plant monitoring and control system equipment at times acceptable to the Commissioner as specified herein.
2. For equipment items not manufactured by the system supplier, on-site training shall be provided by an authorized representative of the equipment manufacturer as part of his services. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.
3. The Contractor shall be responsible for all costs associated with training and shall provide all required materials including training facility rental, computers, simulators, texts and required supplies.
4. The Contractor's System Supplier shall provide classroom training at a local training facility or Conference Center off-site and within a 20 mile radius of the work site. If a System supplier does not have a local training facility within the 20 mile limit, he shall rent such facilities for the duration of the training. All costs associated with providing a local training facility shall be paid by the Contractor.
5. All training shall be conducted during the hours of 8:00 AM to 12:00 AM until conclusion of the training course. All training sessions shall be provided twice and shall be scheduled by the City of New York to accommodate their shift schedule.

- B. Within 90 days of the effective date of the Notice to Proceed, Contractor shall submit his plan for training. Included in the plan shall be course outlines and schedules for training to be provided.

## C. Off-Site Training

1. The Contractor shall provide a supplier who shall perform standardized, structured training courses at training facility staffed with regular full time training instructors covering both operation and maintenance of the system equipment furnished by the supplier.
2. All training shall be scheduled so that it has been completed prior to System Acceptance by the Commissioner.
3. The City of New York will send the following personnel to attend training courses:
  - a. Operations Training: 30 persons
  - b. Maintenance Training: 10 persons
  - c. System supervisor/Engineer Training: 10 persons
4. Operator Training Course
  - a. Provide a one week (5 days, 8 hours per day) course covering the structure and the functions of the SCADA system components and devices. The course shall familiarize the student with the procedures for applying the system to process control problems and develop student programming capability.
  - b. As a minimum, the course shall cover the following topics:
    - (1) Overview of systems functional capabilities
    - (2) Equipment overview including system component functions, operating principals and proper use
    - (3) Loading and start-up of the digital system hardware components
    - (4) Use of system commands
    - (5) Development of programs and control schemes
    - (6) Development and use of system displays
    - (7) Programming concepts and techniques
    - (8) Use of bulk storage device for system backup

5. Maintenance Training Course

- a. Provide a 40-hour course covering preventive and trouble-shooting maintenance for the system components. The course shall familiarize the student with diagnostic capabilities of the system, both software and hardware, and also the routine maintenance procedures on the system and the common peripheral devices. Total training hours: 80.
- b. As a minimum the course shall cover the following topics:
  - (1) System overview description including the power subsystems and logic components of the processor bus
  - (2) Description of the maintenance and trouble-shooting aids of the system including software diagnostic programs
  - (3) Description of all bus operations
  - (4) Description of peripheral and process interface devices
  - (5) The use of hardware diagnostic routines, test equipment and test procedures as required to enable the City of New York's personnel to detect and isolate system faults to the circuit board or module level and to implement repairs by replacing failed circuit boards or modules.

6. System supervisory/Engineer Training

- a. Provide a 40-hour manufacturer's standard training in the use and configuration of the specified HMI software. An instructor certified by the software manufacturer to furnish such training shall perform this training. Total training hours: 80.
- b. System supervisor/engineer training shall be performed a minimum of 30 days prior to system startup.
- c. Training shall be provided in the following subjects:
  - (1) System overview and capabilities
  - (2) Database configuration
  - (3) Graphic display configuration, including linking of data to displays
  - (4) Historical data configuration (collection, manipulation, and display)



- (5) Real-time and historical trending
- (6) Report configuration, generation, printing, and customization
- (7) Alarm configuration and management
- (8) System security
- (9) I/O driver use and configuration
- (10) System backup and recovery
- (11) DDE linking, where applicable
- (12) System command language
- (13) Trouble-shooting
- (14) System optimization
- (15) System startup and shutdown procedures
- (16) LAN and WAN communications, as appropriate

d. The course shall be structured as follows:

- (1) Fundamentals: An 8-hour course (minimum) shall be provided which shall serve as a digital control system familiarization course for project management personnel, engineers, and key operation/maintenance personnel. This course shall be a prerequisite for the advanced course described below in Item 2.
- (2) Advanced: A 24-hour course (minimum) digital system configuration and operating course shall be provided. The level of training shall be sufficient to familiarize the City of New York personnel with the configuration and application of all system programs. All essential system operating procedures shall be described as required to enable the City of New York personnel to operate the system via the various work stations and local control panels.

D. On-site Training

1. Primary Sensors/Transducers and Field Instruments

- a. Provide on-site operation and maintenance training by system supplier and the equipment manufacturer representatives prior to placing the

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equipment in continuous operation. The services of equipment manufacturer's representatives shall be provided for a minimum of eight (8) hours for each type of instrument provided.

- b. Training covering control equipment
  - (1) Provide instruction covering use and operation of the equipment to perform the intended functions.
  - (2) Provide instruction covering procedures for routine, preventive and trouble-shooting maintenance including equipment calibration.
  - (3) Explain procedures for placing the equipment in and out of operation and explain necessary actions and precautions to be taken regarding the overall plant monitoring and control system.

2. Training covering control equipment:

- a. The System Supplier shall provide 80 hours of operations training covering all system components.
- b. Training course shall accomplish the following:
  - (1) Provide all instructions necessary to operate and utilize all system components.
  - (2) Provide all instruction necessary to monitor and control the system processes from the designated control panel.
  - (3) Explain procedures for control of the system during scheduled or rescheduled shutdown and the subsequent start-up.
  - (4) Provide instructions for regular caretaking operations.

3. PLC Training: The SCADA system supplier shall provide 40 hours of training that covers PLC as follows:

- a. Provide an overview of system hardware and software.
- b. It shall train people in configuration, operation and programming PLCs.
- c. The emphasis shall be placed on how to perform set point changes, minor programming changes, range changes, diagnostics and upkeep of documentation.
- d. Instruction for hardware and software maintenance, trouble shooting and maintenance planning.

4. Training following two months of regular system operations:
  - a. The system supplier shall provide operation and maintenance covering all system equipment provided.
  - b. The training shall be of the same format, content and duration as the training described in items 1, 2 and 3 above.

-END OF SECTION-

**Section 17210**  
**SCADA SYSTEM - OPERATOR WORKSTATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install, calibrate, test, startup, and place into satisfactory operation the operator workstation(s).

**1.02 RELATED SECTIONS**

- A. Section 17101 - SCADA System - General Requirements
- B. Section 17213 - SCADA System - Computer Consoles

**1.03 QUALITY ASSURANCE**

- A. Comply with the requirements of Section 17101 - SCADA System - General Requirements.

**1.04 SUBMITTALS**

- A. The Contractor shall comply with the requirements specified in Section 17101 - SCADA System - General Requirements, and include the following information in the submittal for this Section:
  - 1. A description of the operator workstation displays including:
    - a. How the operator requests the display and what options are available.
    - b. What the operator can accomplish via the display and how each function is performed.
    - c. Access restriction features and the functions accessible in each access level for each display.
  - 2. A description of alarm handling. Describe how alarms are presented and how the operator used the information to access the points in alarm.
  - 3. A description of fault detection, isolation, and correction. List the on-line and off-line diagnostics. Describe how they are used and describe the various execution options available for each.

4. A description of how software is configured including but not limited to:
  - a. Input/output points
  - b. Graphic displays
  - c. Alarm/event functions
  - d. Trending functions
  - e. Standard and user defined libraries
5. A description of how the unit can be configured to address other equipment including but not limited to:
  - a. Programmable Logic Controllers (PLC).
  - b. Printers
  - c. Other peripheral options which can be furnished as part of a standard package.

#### 1.05 MAINTENANCE

- A. Provide the following spare parts:
  1. One display monitor
  2. One keyboard
  3. One PC
  4. One pointing device (mouse or trackball)
- B. Provide special tools necessary for normal operation, maintenance and diagnostic aids.
- C. Upon failure of the operator workstation, system component connections shall not affect the operation of:
  1. Data highway
  2. PLCs
  3. Other operator workstations

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. General
  1. Provide equipment to operate on 115 volt AC, single phase, 60-hertz electrical service.

2. Provide all necessary items for installation, including mounting brackets, interconnecting cables, hardware and appurtenances.

B. Computer Hardware, minimum requirements

1. Workstation

- a. Processor: one Xeon Processor operating at 2.8Ghz
- b. Front Side Bus: 533 MHz
- c. Memory: 2GB of Registered ECC PC2100 DDR-266 memory
- d. Monitor: 20" flat panel LCD display
  - (1) LCD Type: TFT active matrix
  - (2) Video Input Signal: Analog RGB and digital DVI-D
  - (3) Pixel Pitch: No greater than 0.294 mm
  - (4) Viewing Angle: 85 degrees nominal
  - (5) Contract Ratio: 600:1
  - (6) Brightness: 250 nits
  - (7) Prime Mode: 1280 x 1024 (SXGA)
  - (8) Mounting: VESA-compliant adapter plate
- e. Graphics accelerator card: NCIDIA Quadro FX 1100 with 128 MB
- f. Hard Drive: 160 GB Ultra ATA
- g. Removable Drives: CD-RW+DVD combo and 256 MB USB drive key storage
- h. Modem: 3 Com Sportster 56K Modem w/V.90 technology
- i. Mouse: Microsoft System Intellimouse
- j. Communications Card: Integrated gigabit LAN 10/100/1000
- k. Keyboard: 104+ keys
- l. Documentation: Provide all documentation, manuals and licenses
- m. Environmental: Control Room environment (see Section 17101 for environmental requirements)
- n. Safety/Regulatory: UL, FCC B, approved

2. Latest revision of software at time of bid required

- a. Windows XP Professional
- b. Microsoft Office Professional
- c. McAfee Virus Scan

2.02 USER FUNCTIONS

- A. Connect to the data highway for display of the status of the process and equipment within the plant. See System Block Diagram for intended functionality. Load and configure Human-Machine Interface software (HMI).
- B. Permit control actions and control parameter access to allow the operation to monitor and control the process.
- C. Function as a totally independent unit by receiving data directly from the PLCs over the data highway.
- D. Provide display selection, control adjustments and control security, data entry, and other related user entry functions.
  - 1. Use cursor keys and pointing device to select targets or information.
  - 2. Use hard or soft function keys to execute commands.
  - 3. Use numeric keys for data entry.
- E. Check entries for proper sequences and logical commands. Display messages for invalid entries. State reason why command was invalid.
- F. System Security
  - 1. Provide the following password protected modes:
    - a. Display to allow only monitoring.
    - b. Operate to allow operator functions to be performed.
    - c. Configure to allow programmer/engineer functions to be performed.
  - 2. Provide password protection for each mode of user access for up to 512 user passwords.
  - 3. Provide an on-line method for a designated high level user to display and change password assignments.
- G. Provide the following functions in the display mode:
  - 1. Sign on/sign off (enter password).
  - 2. Select and view displays.
  - 3. Print displays.

H. Provide the following functions in the operate mode:

1. Display mode functions.
2. All other functions not expressly reserved for the configure mode.

I. Provide the following functions in the configure mode:

1. All display and operate mode functions.
2. Add, modify, delete passwords.
3. Add, modify, delete graphic displays:
  - a. Lay out graphics and text
  - b. Define colors
  - c. Attach dynamic data and targets.
4. Add, modify, delete input/output points.
5. Add, modify, delete reports:
  - a. Change format
  - b. Add, delete, move points
  - c. Add, delete, modify calculations
  - d. Modify automatic scheduling.
6. Change system time or date.
7. Backup to diskette.
8. Change which functions are assigned to which mode.
9. Startup, shutdown, and general programming activities.
10. Control strategy generation and modification in each PLC.

## 2.03 DIAGNOSTIC AND TEST

A. Provide a fault detection, isolation, and correction on a card level basis. Use LEDs on cards and diagnostic displays. Identify intermittent and continuous failed components. Perform self tests continuously and include as a minimum:

1. Power supply failure
2. Processor failure
3. Memory failure
4. Internal I/O bus failure
5. Communications failure



- B. Upon failure of any self check, halt operation until manually or automatically reset.
- C. Upon power up or resetting, reload the operator workstation configuration within 30 minutes. Perform this function using back-up software.

## 2.04 PRODUCT MANUFACTURERS

- A. Provide operator workstation of one of the following:
  - 1. HP
  - 2. Dell
  - 3. IBM

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Operator workstations shall be installed as shown. Provide all mounting hardware required for a seamless mounting.
- B. Mount workstation to computer console as shown, and in accordance with Specification Section 17213 - SCADA System - Computer Consoles.

### 3.02 SERVICE CONTRACT

- A. Each operator workstation shall be provided with an on site service contract for a minimum of three years from date of acceptance by the City of New York. The balance of the service contract shall be transferable from the contractor to the City of New York upon contract closeout. The cost of the service contract shall be included in the lump sum price.
- B. Upon notification of service interruption, the service contract provider shall repair the operator workstation or replace in kind with complete software restoration within two workdays.

-END OF SECTION-

**Section 17212**  
**SCADA SYSTEM - PROGRAMMABLE LOGIC CONTROLLERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install, calibrate, test, startup, and place into satisfactory operation Programmable Logic Controllers (PLCs).
- B. PLC hardware specified herein shall be of the Process Automation Controller (PAC) type system, functioning as a PLC and including all extended features. Configuration and documentation of all Programmable Logic Controllers shall be performed by the Contractor.

**1.02 RELATED SPECIFICATIONS**

- A. Section 17101 - SCADA System - General Requirements
- B. Section 17250 - SCADA System - Plant-Wide Network Equipment
- C. Section 17320 - SCADA System - Control Panels and Enclosures

**1.03 QUALITY ASSURANCE**

- A. All materials and equipment furnished shall be new, free from defects, and of first quality, produced by manufacturers who have been regularly engaged in the manufacture of these products.
- B. Where there is more than one item of similar equipment required under the Contract, all such similar equipment shall be the product of one manufacturer. All PLCs provided under this Contract shall be of the same manufacturer.
- C. All material furnished under this Contract shall be determined safe by either Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation and all material shall be labeled, certified, or listed by the testing agency.
- D. Custom made equipment or related installation that is constructed specially for this Project will not be acceptable. Equipment furnished within this contract shall be a standard product, furnished by a supplier regularly engaged in the manufacture of such products.

**1.04 SUBMITTALS**

- A. Comply with the requirements of Section 17101.

## 1.05 SPARE PARTS, TOOLS AND SUPPLIES

- A. The Contractor shall furnish all spare parts in conformance with Section 01750 – Spare Parts and Maintenance Materials. Deliver all spare parts, tools and supplies with the equipment, neatly wrapped or boxed, indexed and tagged with complete information for use in reordering.
- B. Furnish the following spare parts:
  - 1. Ten percent spare I/O modules for each type furnished, with a minimum of one.
  - 2. Ten percent spare communication modules for each type furnished (Ethernet, Remote I/O, PLC LAN), with a minimum of one.
  - 3. Ten percent spare CPUs of each size and type furnished, with a minimum of one.
  - 4. Ten percent spare PLC rack of each type and size furnished, with a minimum of one.
  - 5. Ten percent spare Power supplies of each size furnished, with a minimum of one.
  - 6. All spare parts (Qty.1) recommended by manufacturer and listed as recommended spare parts in the manufacturer's submitted O&M manual
- C. Tools: Furnish all tools necessary to service, disassemble, repair, and adjust the equipment.

## PART 2 PRODUCTS

### 2.01 PROGRAMMABLE LOGIC CONTROLLERS

- A. General
  - 1. Provide programmable logic controllers as shown on the Contract Drawings and as specified herein. PLC's shall be provided with all necessary components to accomplish the specified requirements. Provide an interface with keypad to facilitate changes of setpoints, timer and counter presets, etc., mounted inside the panel with the PLC.
  - 2. The PLC shall be configured by Contractor to perform functions shown and specified. The Contractor shall coordinate and obtain from all equipment suppliers PLC systems of the same manufacturer and series.

3. Functions to be performed by the PLC include but are not necessarily limited to the following:
  - a. Alarm and status indication
  - b. PID control and arithmetic functions
  - c. Interlock and sequential logic control of processes and equipment operations
  - d. Collection and transmission of data and control parameters to and from other PLCs
  - e. Provide a dry contact rated 2 Amperes at 120 Volts AC for remote indication of processor failure.
4. The PLC shall be electronic type furnished with all necessary relays, timers, counters, and latches as data manipulative functions and arranged into the format required to accomplish the functions shown and specified.
5. The PLC shall be designed and constructed for the demanding requirements of real-time process management and control on a continuous basis for use in a waste transfer facility.
6. The manipulative functions shall have the capability of being rearranged into any desired format while the controller is performing other control tasks.
7. Expansion of the controller by the input/output points, internal data manipulative functions, and relays, timers and counters shall be accomplished by reprogramming.
8. The control programs and applications memory of the PLC shall be capable of being remotely (off-line) and locally (on-line) monitored, programmed, modified and displayed by use of a personal computer and documentation software which shall be provided as part of this contract. In addition, the PLC shall be capable of being programmed by an external PC compatible host device via an Ethernet communication port. The host communication interface shall allow controlled access for authorized users via password protection to all registers, I/O system fault status and I/O override.
9. The logic shall be entered and displayed in ladder diagram and functional block format. The ladder diagram format shall contain a complete cross-reference with each coil referred to in logic and identified as normally open or normally closed. Mnemonic information shall be added to each coil and to both real and internal I/O points. Alphanumeric titles and descriptions shall appear on the screen.

10. Any restructuring of the control logic shall be done at the PLC installation and shall not necessitate any removal of the mainframe to another location.
11. The controller mainframe shall be arranged in modular type design. All inputs, outputs, and logic control interface units shall be easily removed for ease in replacement or restructuring the hardware arrangement. Shut down of the processor control logic (halting of program scan) shall not occur when remote input/output modules are removed.
12. In the event of a power failure or malfunction of the logic hardware, the controller shall provide dry, Form C contact closures for remote and local indication and alarming.
13. A self-diagnostics package to determine proper processor operation shall be included. Diagnostic LED shall be provided in clear view on the front of the PLC enclosure.
14. Changing an on-line control logic process operation shall not necessitate the halting of the processor.
15. Burn-in for all printed circuit boards and modules shall be performed at the factory.
16. Equipment shall conform to NEMA ICS 3-304.
17. The primary interface to the process equipment and field devices shall be provided by the input/output system consisting of I/O modules installed in mounting racks. The input/output system hardware shall be designed with the following features:
  - a. Noise immunity and filtering
  - b. IEEE surge-withstand rating to IEEE 472
  - c. Optical isolation for all inputs and outputs to provide controller logic protection
  - d. No on board pots requiring adjustment or maintenance
  - e. Any card, any slot, plug-in packaging, with locking bars and/or screws to hold I/O modules in place
  - f. 300-volt, screw type, field wiring terminal strips sized to accommodate a minimum of two No. 14 AWG wires per terminal. Terminal strip design shall allow I/O module removal and replacement without disturbing wiring connections.

- g. A Front-of-module LED status indicator for each individual input and output point to indicate when power is applied at I/O terminals
- h. Individually fused output circuits for all output modules. Fuses shall be capable of being inspected without removal of and replaced without disassembly of the output module. For individually isolated output modules, front-of-module blown fuse LED status indicators shall be provided for each output point. For non-isolated (common output power source) output modules, common blown fuse LED status indicators shall be provided for a maximum of every four points.
- i. All outputs for contactors and relays shall be rated for a minimum of 2.0 Amps continuous at 120 VAC. Higher rated outputs and/or interposing relays inside the control center shall be provided in order to assure that ratings of the output contacts are not exceeded. Coordinate with equipment being controlled by the respective outputs.
- j. For outputs to motor contactors and other equipment type load relays, provide transient and inrush surge suppressor connected across the output contact terminal and the neutral-common terminal inside the control center to suppress the switching surge transient to lower than the continuous rating of the output contacts.
- k. The maximum number of points per I/O module shall be as follows:
  - (1) Discrete: 16
  - (2) Analog: 8
- l. The following types of I/O modules shall be provided for use with the supplied PLC System:
  - (1) Analog Inputs (12 bits minimum)
    - (a) 0-10 VDC
    - (b) 1-5 VDC
    - (c) 4-20 mA DC (250 Ohms maximum impedance)
    - (d) Millivolt signals
  - (2) Analog Outputs (12 bits minimum)
    - (a) 4-20 mA DC (load of 750 Ohms minimum)
    - (b) 0-10 VDC
    - (c) 1-5 VDC

- (3) Register Inputs and Outputs (16 bit)
  - (a) Single BCD
  - (b) Multiplexed BCD
- (4) Discrete Inputs
  - (a) 5 V, 12 V, 24 V, 48 V and 120 VAC/VDC in both isolated and common circuit types
  - (b) TTL Logic
- (5) Discrete Outputs
  - (a) 120 VAC in both isolated and common circuit types
  - (b) 12-120 VDC
  - (c) Form C Relay Contacts
  - (d) TTL Logic
- (6) High Speed Encoder/Counter
  - (a) Accept and count pulse inputs independently and unaffected by I/O scan or program scan.
  - (b) Minimum pulse rate of 50 Khz.
- (7) Remote I/O Subsystem
  - (a) Remote I/O shall be provided as designated on the Control System Block Diagram. Remote I/O shall be either PLC rack type I/O or intelligent field modules (FIELD Control I/O for GE, FLEX I/O for AB), as manufactured by the PLC manufacturer. Field modules shall meet the requirements of Input/Output Subsystems. Remote I/O processor or communication modules shall be modular and individually replaceable.
  - (b) Remote I/O shall communicate with PLC CPU using the PLC manufacturer's communication bus for remote I/O. Genius LAN for GE Fanuc PLCs, DH + for AB PLCs and Modbus Plus for Modicon PLCs. All required cabling shall be furnished under this contract and use the conduit system as indicated on the Electrical Drawings. Provide adequate lengths. Cabling will be installed under the Electrical contract. Supervision and testing of the installations shall be provided and be in conformance with Section 17250 requirements for supervision and testing.

18. Signal and control circuitry to individual input/output boards shall be arranged such that board failure shall not disable more than one half of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.). Where possible, individual control loops and equipment shall be assigned to individual boards such that failure of the board will disable only one loop or piece of equipment. Valve actuator loops shall be assigned on a per tank basis to limit common point of failure.

**B. Required Features**

1. Construction: Modular printed circuit boards.
2. Type: Electronic components with central processing unit and software reprogramming capabilities.
3. Memory
  - a. System Memory: Electrically Erasable Non-volatile type (EEPROM) or Lithium battery-backed RAM with minimum retention time of 2 years under worst-case conditions.
  - b. Application Memory
    - (1) Type: Lithium Battery-backed RAM with minimum retention time of 2 years under worst case conditions, or RAM with EEPROM or NOVRAM backup modules.
    - (2) Size: As required for present and dedicated future I/O capacity and for performance of the specified functional requirements plus 25 percent spare capacity as a minimum.
4. Language Format: Ladder type diagrams and functional blocks.
5. Provide type and quantity of I/O as required to perform the operational and functional requirements plus 20 percent active spare (minimum of one module) for each type of I/O module used. Active spare points shall be mounted and wired ready for use and shall require only field wiring connections and software configuration to place the point in service.
6. Internal Functions: Relays, timers, counters, latches, internal storage registers, and other functions as required to perform specified functional requirements plus 25 percent spare capacity.
7. Report Generation: Processor shall have the capability to store and automatically communicate up to 198 ASCII status/ alarm/diagnostic type



messages to a peripheral display device via the RS-232C output port at rates up to 19.2 K bits/second.

8. Security Features: Key switch interlock on PLC and/or security password protection through system programmer terminal to prevent tampering of logic sequences and unauthorized programming.
9. Processor Scan Time: 2 ms per 1 K bytes of memory typical.
10. Operating Temperature: 32°F to 140°F
11. Storage Temperature: Minus 40°F to 160°F
12. Power Supply: 120 VAC,  $\pm 10$  percent with fuse or circuit breaker protection. Supplies shall be sized for a minimum of 130 percent of maximum simultaneous current draw in accordance with Section 17101.
13. Data Communications: The PLCs provided shall be capable of peer-to-peer communications with other PLCs of the same and different types by means of manufacturer standard data highway system. Highway system design shall be a token-passing, masterless, high-throughput serial communication bus that connects the PLCs by means of intelligent network interface modules at the highway drops. Minimum local highway speed shall be 50 K baud and highway system design shall be upwardly compatible with the MAP industry standard protocols (DeviceNet, ControlNet, Modbus, Ethernet). All PLC(s) shall be provided with Ethernet networking capability using TCP/IP protocol. All modules required shall be provided.
14. Clock: Battery-backed clock with typical variation of  $\pm 20$  sec. per month.
15. Programming/Documentation Software
  - a. Provide PLC programming/documentation software package (WINDOWS NT compatible) that shall be fully menu-driven and self-prompting. All software provided shall be year 2000 compliant. Furnish certification with software. Package shall provide fully integrated ladder diagram programming and documentation. The package shall allow 3 lines of mnemonics per ladder element with 6 characters per line minimum. It shall also provide for the inclusion of the following documentation information for ladder diagram contacts and coils:
    - (1) Panel I/O wiring list
    - (2) Rack number
    - (3) Module position slot number
    - (4) I/O module type
    - (5) Terminal number and wire number

- (6) Electrical and Mechanical Drawing Reference Number
  - (7) Description of up to 240 characters in length for each element
- b. The programming/documentation software displays shall allow the user to flip between documentation and the uncommented rung as it resides in the controller. Software shall also allow selection of single rung and continuous ladder diagram printouts.
- C. System configuration shall be as shown on the Drawings. Memory and processor shall be adequate for all control functions specified. PLC(s) shall be as manufactured by, or equal to, those listed in the following table.

Manufacturer	Micro	Small/Mid-Size	Large
Allen-Bradley	Flexlogix with Ethernet/IP, DeviceNet and ControlNet communication	Compact-Logix with Ethernet/IP, ControlNet and DeviceNet communication	Control-Logix w/ hot backup CPU, Ethernet/IP, ControlNet and DeviceNet communication
GE-Fanuc	Versamax with RS-485 and DeviceNet communication	PACSystems RX3i w/300 CPU with Ethernet EGD and Genius Modbus TCP communications	PACSystems RX7i with 1.8 ghz redundant CPUs with embedded Ethernet, Genius LAN and Modbus TCP over Ethernet communication
Modicon	Micro PLC with Modbus and RS-485 communication	Momentum MIE with Ethernet and Modbus communications; Quantum PLC 140 CPU 311 10.	Quantum PLC CPU 651 60 with Hot Standby, CPU Modbus and Ethernet communication

- D. No more than one word shall be required for each contact or coil including address, no more than one word for a branch, no words for spaces or connects, and no words shall be required to begin a new rung. Scan time refers to nominal memory scan time of words of relay ladder logic, with an "immediate I/O update" command to operate on instantaneous alarm information. Unprogrammed memory shall not be scanned.

- E. PLCs shall meet the following minimum performance requirements per designated type as listed in the following table.

Manufacturer	Micro	Small/Mid-Size	Large
Allen-Bradley	Flexlogix with Ethernet/IP, DeviceNet and ControlNet communication	Compact-Logix with Ethernet/IP, ControlNet and DeviceNet communication	Control-Logix w/ hot backup CPU, Ethernet/IP, ControlNet and DeviceNet communication
GE-Fanuc	Versamax with RS-485 and DeviceNet communication	PACSystems RX3i w/300 CPU with Ethernet EGD and Genius Modbus TCP communications	PACSystems RX7i with 1.8 ghz redundant CPUs with embedded Ethernet, Genius LAN and Modbus TCP over Ethernet communication
Modicon	Micro PLC with Modbus and RS-485 communication	Momentum MIE with Ethernet and Modbus communications; Quantum PLC 140 CPU 311 10.	Quantum PLC CPU 651 60 with Hot Standby, CPU Modbus and Ethernet communication

- F. PLC Operator Interface. Provide one of the following:

1. DTAM Plus Operator Interface for AB PLCs, as manufactured by Allen Bradley Company.
2. OTU 157 for GE PLCs, as manufactured by General Electric.
3. TSX Quantum Automation Series for Modicon PLCs (with ASCII operator keypad), as manufactured by Modicon.
4. Or approved equal.

## 2.02 PORTABLE PROGRAMMING UNIT

- A. The Contractor shall provide a notebook computer portable programming unit for all PLCs furnished for loading the control plan into the processor memory and monitoring the data table. The programming and monitoring equipment shall be able to interface with the controller during operation. The portable programming unit shall be furnished with Ethernet and serial (RS 232/422) communication interfaces. The portable programming unit shall have the following features as described below:

1. The portable programming unit shall be capable of continuous operation at temperature of 0-50°C (32-122°F), humidity levels of 5-95% non-condensing, vibration levels of 0.2" (9.58mm) peak to peak @ 5 to 10 Hz, and noise immunity levels as described in NEMA arc test (ICS 2-230).
  2. The portable programming unit shall contain a LCD terminal and a keyboard. There shall also be a built-in temperature sensor to alert the operator with an alarm message, if the internal temperature exceeds 60°C.
  3. The portable programming unit shall have one 3 1/2" internal floppy disk drive with 1.44 M bytes of data storage and one internal hard disk drive of 20 G-byte of data storage.
  4. The display shall be a 14.1" color TFT active matrix type.
  5. The portable programming unit shall contain a minimum of 64 Mb RAM programming memory.
  6. The portable programming shall be provided with an Intel Pentium 4 based 1.7 Ghz or greater CPU.
- B. The portable programming unit shall connect to the CPU through a non-remote I/O port, a Data Communications port, or a programming port on the CPU, depending upon the particular programmable controller device.
- C. The portable programming unit shall be capable of programming the controller system through the use of a ladder logic instruction set. It shall also be possible to observe the I/O status and the register values. Overriding of inputs and outputs shall also be possible.
- D. The portable programming unit shall be capable of basic programming functions, which shall include normally-open normally-closed contacts, latch relays, one shots, timers, and up-down counters.
- E. The portable programming unit shall contain an available field of nine (9) contacts and one (1) coil across by seven (7) contacts down, for each rung of the program.
- F. The portable programming unit shall be capable of modifying the program element-by-element or rung-by-rung. The workstation shall also be capable of complete program documentation.
- G. The portable programming unit shall have the following three modes of operation: on-line, off-line, and monitor.
- H. The portable programming unit shall be capable of displaying the status of contacts, coils, timers, counters, and registers while in the monitor mode.

- I. The portable programming unit shall be capable of normal programming in the off-line mode.
- J. The portable programming unit shall be capable of editing, and modifying the running program while in the on-line mode.
- K. The portable programming unit shall be as manufactured by Dell, Hewlett Packard or approved equal.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install each item in accordance with manufacturers recommendations and in accordance with the Contract Documents.
- B. Configure PLC to prevent erroneous and nuisance alarms by using techniques including time delays and logic. For example, inhibit initiation of a seal water failure alarm when pump is not running and provide a time delay on high discharge pressure alarm.
- C. Arrange PLC data table. Repeat all status and alarm bits and analog values (including timer and counter presets) into a separate, contiguous block of memory, grouped by type. Provide 25% space in each group to allow for future expansion.
- D. Configure operator interface unit using function keys and instructional prompts so that operators can modify setpoints and presets without any special training or knowledge of the PLC program.
- E. A modular and structured approach to PLC program development shall be implemented. The programs shall be broken up in logical segments to allow easy debugging in the field.
  - 1. All real world outputs/inputs shall be grouped such that their addresses can be mapped in contiguous registers so as to allow use of matrix functions for trouble-shooting, debugging, and alarming.
  - 2. An alarm segment shall be developed for all real world outputs. The alarm segment shall be separate from the rung logic for real world outputs.
    - a. For open/close valves, the associated limit switch positions shall be compared with the PLC output. If the output calls for an open valve, the open limit switch should be made and the closed switch should not and vice versa. Any combination other than these two shall cause an alarm.
    - b. The PLC shall monitor limit switch positions for valves in transition.

- c. Valves in transition (between open and close position) shall be displayed on the operator interface with message "In Transition". The Contractor shall submit limit switch development for all valves.
  - d. For motors, the run output shall be compared to the run status with the appropriate time delays. Any mismatch between RUN output and RUN status shall cause an alarm.
- 3. Unless waived in writing by the Commissioner, application programs written for PLCs shall be written using ladder logic, showing discrete references in individual ladder rungs. Each output shall have its own complete set of logic to aid in startup and trouble-shooting. Where duplicate or repetitive logic is required subroutines shall be used to reduce program memory requirements and scan time. The program shall be written in a logical sequence with associated rungs grouped together in a manner to make the system logic clearly evident.
  - 4. Where multiple rungs use the same constants for associated presets or reference, the constant shall be in the form of a register location and shall be loaded in the beginning of the program each time it is run. All preset register values shall be part of the program and load each time the program is run. Where possible, constants that must be calculated shall have this done in the program.
  - 5. Where values must be input, whether in the program or during operation, software "traps" shall be used to prevent input of values out of range or that will cause improper operation of the system.

### 3.02 START-UP, CALIBRATION, AND TESTING AND TRAINING

- A. The Contractor shall comply with the requirements of Section 17101.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 17213**  
**COMPUTER CONSOLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install the control system consoles and accessories, as specified herein and as shown on the Drawings.

**1.02 RELATED SPECIFICATIONS**

- A. Section 12500 – Furniture
- B. Section 17101 - SCADA System - General Requirements
- C. Section 17210 - SCADA System - Operator Workstation

**1.03 QUALITY ASSURANCE**

- A. Comply with the requirements of Section 17101.
- B. Computer console supplier shall be ISO 9001 certified, and shall have at least three years experience in console design and manufacturing.
- C. Computer console installers shall be certified by the supplier, and shall have experience installing similar systems.

**1.04 SYSTEM DESCRIPTION**

- A. Design Requirements
  - 1. The console system shall incorporate a highly flexible system of components capable of being adapted to changing technical requirements during the life cycle of the console.
  - 2. The console shall be designed to withstand the rigors of around-the-clock control room operation and shall incorporate a wide range of ergonomic features to ensure operator comfort during extended shifts.
  - 3. The internal structure of the console shall firmly anchor a wide range of equipment mounting and operator convenience features while still providing convenient access to the equipment mounted within the console.



## 1.05 SUBMITTALS

- A. The Contractor shall comply with the requirements specified in Section 17101 and as follows:
  - 1. The console supplier shall provide design and application support by:
    - a. Determining the console functional design requirements. Coordinate with the relative equipment suppliers to ensure that all equipment specified to be mounted in console is installed correctly per manufacturer's recommendation.
  - 2. Submitting pre-fabrication review drawings and component listings.
  - 3. Samples: Submit three samples of all standard and custom work surface, module and exterior panel color options for selection and approval by the Commissioner.
  - 4. Supply experience qualifications as required in the subsection titled "Quality Assurance."

## PART 2 PRODUCTS

### 2.01 OPERATOR WORKSTATION CONSOLES

- A. Provide operator workstation consoles as specified herein and as shown on the Contract Drawings. Arrangement of console modules shall be as shown on the Contract Drawings.
- B. Description
  - 1. The console shall consist of multiple base cabinets, wedge cabinets, work surfaces, slat walls, accessories and appurtenances as shown and required to provide a complete console assembly.
  - 2. The console shall be of the open, desktop type as shown.
  - 3. The console shall include articulating arms for supporting flat panel displays as specified in Section 17210.
  - 4. The console shall be configured from standard offering, freestanding structures, capable of being reconfigured on site without cutting.

**C. Base Cabinets**

1. The base cabinet modules shall be straight modules, constructed of steel and aluminum.
2. Width: 24 inches
3. Depth: Full depth, capable of holding two tower-type personal computers facing forwards. The manufacturer shall have both full depth and reduced depth models available.
4. Configuration
  - a. Several mounting kits shall be provided to permit configuration of the interior of the base cabinets as specified and shown:
    - (1) Slide-out shelf: capable of holding two tower-type personal computers facing towards the console operator. The manufacturer shall have additional shelf types available, including a fixed type and a lower door mounted swing-out type.
    - (2) Rack mounting assembly: 19-inch EIA-standard racks, for mounting additional network and computer equipment, facing towards the console operator.
  - b. Mounting kits shall be supplied, designed to support the electronic equipment specified.
    - (1) Reconfiguration of the console shall be possible by swapping mounting kits without modifying the base cabinet or external panels.
    - (2) The mounting kits shall be constructed of heavy gauge sheet metal with perforations to ensure adequate ventilation.
    - (3) The mounting kits shall be capable of anchoring the electronic equipment specified for seismic considerations.
5. Integrated Cable Management: Each console module shall be constructed to provide continuous cable trays between modules for ease of equipment installation and maintenance.
6. Power Bars: Each console module shall be furnished with external 120 Vac outlets. Each section shall include six outlets, controlled by individual breakers rated at 15 amps.

7. Each base cabinet shall incorporate levelers to ensure that adjacent modules are perfectly aligned after installation.

D. Wedge Cabinets

1. Wedge cabinet modules shall be provided as shown.
2. The manufacturer shall have the following standard wedge angles available:
  - a. 15 degrees
  - b. 22.5 degrees
  - c. 30 degrees
  - d. 45 degrees
3. Integrated Cable Management: Each wedge module shall be constructed to provide continuous cable trays between modules for ease of equipment installation and maintenance.

E. Work Surfaces

1. Minimum one-inch core
2. Surface: High pressure laminate of the same type and pattern as that provided for furniture supplied under Section 12500 – Furniture.
3. Color selected by the Commissioner
4. Black high impact extruded work surface nosing and baseboard.

F. Slat Walls

1. Provide 6-inch rear slat wall as shown. The manufacturer shall have additional slat wall sizes available, including 12-inch and 18-inch sizes.
2. Designed as connection point for monitor arms.

G. Accessories

1. Monitor Arm
  - a. Support flat-panel computer monitors up to 25.5 lbs.
  - b. Fully adjustable, including height.
  - c. Includes slat wall mount and VESA-compliant adapter plate.
  - d. Provide monitor arms as shown and required.

2. Under Work Surface Keyboard Tray

- a. Slide out keyboard trays with integrated palm rest shall be furnished below each base cabinet work surface.
- b. Provide cable pass through.
- c. The tray shall accommodate keyboards up to 20" wide in a low profile configuration to provide maximize operator knee space.

3. Fans

- a. Integral ventilation fans shall be included in each base cabinet module.
- b. Fans shall be 120 VAC powered and UL listed
- c. Output: No less than 30 cfm
- d. Noise: Less than 30 dBA

H. Exterior Panels

1. Exterior panels shall include the console front, back and side panels. The panels shall be supported by, and enclose, the cabinet structural frame. The panels shall be easily removed for convenient access to the equipment mounted within the console. Individual panels under the work surface shall be hinged to facilitate access to the console interior.
2. The console shall be furnished with a ventilation grill assembly.
3. The exterior panels and cabinets shall be designed to ensure an air intake at the bottom of the console and exhaust at the top in order to provide proper ventilation of the equipment housed within the console.
4. External panels, modules and accessories shall be provided with scratch resistant baked enamel coating, in colors selected by the Engineer.

I. Product and Manufacturer: Provide one of the following.

1. Axiom Series, as manufactured by Evans Consoles, Inc.
2. 3600 Series, as manufactured by Tresco Consoles
3. Or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Contractor, via the console supplier, shall provide factory certified personnel to supervise the site installation of console by the Contractor. The Contractor shall provide the console manufacturer's certification to the Engineer that the console was

installed per the console manufacturer's recommended installation procedures and requirements.

- B. The adjacent modules shall be leveled and bolted together to form a structural cage.
- C. The equipment installed within the console shall be wired and tested prior to application of the external cladding panels.
- D. A minimum of one day of manufacturer's services on site shall be included.

-END OF SECTION-

**Section 17230**  
**SCADA SYSTEM - HMI SOFTWARE REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall supply the HMI software capable of performing the tasks specified in Division 17 of these specifications.

**1.02 RELATED SPECIFICATIONS**

- A. Detailed Specification 17101 - SCADA System - General Requirements

**1.03 REFERENCES AND CODES**

- A. The following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern nomenclature; define parameters of configuration and construction, in addition to specific details in this Specification and the Contract Drawings:
  - 1. ISA - International Society for Measurement and Control
  - 2. ISO - International Standards Organization

**1.04 SUBMITTALS**

- A. The Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Commissioner in accordance with Section 01300 - Shop Drawings.

**1.05 SCADA SYSTEM SOFTWARE**

- A. The purpose of this Specification is for the Contractor to install, configure and test in all the operator workstations under this Contract the HMI software. The HMI software shall be used for all operator interfaces furnished under this Contract. The SCADA System Software, henceforth referred to as the HMI software, shall be standardized throughout the facility. For the purposes of this Section, the term workstation shall be used to indicate all computers used for operator interface, data acquisition and archiving, alarm and control. These shall include, but not be limited to, desktop/tower type PCs, console-mounted PCs, Network servers, NEMA-rated operator interface units/terminals and all local operator interface terminals that are running Microsoft Windows XP operating system.
- B. A single software package shall be used for all workstations throughout the Project. The Contractor shall install the appropriate number of copies of HMI software on the designated servers and workstations for this Contract. Once installed and operating, and the project is completed and accepted, all licenses,

media, documentation and packaging shall be turned over to the City of New York. It is the responsibility of the Contractor to maintain all items entrusted to him in excellent condition. Any damaged items or items not returned will be replaced at the Contractor's expense. A minimum of two (2) of the servers shall be capable of configuration with the balance being used for runtime support.

- C. It shall be the responsibility of the Contractor, through the services of the SCADA system supplier, to install, setup, configure and place in optimum working order the HMI software, as well as all other software referenced herein. All software shall be installed and configured with strict adherence to manufacturers recommendations and the requirements of this Specification on all workstations supplied under this Contract.
- D. The HMI software shall be sized for an unlimited number of tags.
- E. The site license shall include the latest version at bid time of the following software options:
  - 1. Server Redundancy
  - 2. Historical Data Analyzer
  - 3. Pager
  - 4. Action Calendar
  - 5. PLC Communication Drivers

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Proficy (iFix Edition)
- B. Rockwell RS View 32
- C. Or approved equal

### 2.02 MONITORING AND CONTROL FUNCTIONALITY AND OPERATIONAL OVERVIEW

- A. The following sections provide a general overview of the expected functionality of the system. Subsequent sections deal more directly with the expectation for specific product characteristics and the requirements in those sections shall be applied to the individual products and solutions provided.
- B. Graphical Representation
  - 1. The core aspect of the overall system is a network of graphical screens specifically designed for the day-to-day operation of the facility. These graphical images shall be created and maintained to provide symbolic representation of the overall working of the actual equipment and the associated processes.

2. The graphical screens shall contain a wide variety of textual and graphical animation to represent the process. This animation shall include, but not be limited to, color changes, object rotation, object filling, etc.
  3. The screens shall be networked in a hierarchy to allow for context sensitive access to the system and varying levels of detailed information. There shall be a high level screen showing a site overview with built-in transitions to "zoom" into various areas. The amount of detailed information on the particular areas shall increase as the user "zooms" closer to the operation level of the individual control areas.
  4. At the remote control locations, the operator interface shall be restricted to the graphical HMI interface. This shall be accomplished through configuration of automatic boot-up into the HMI application and the disabling of soft key access to anything but the graphical application. The graphical application shall be forced to full screen with no other options available to the operator.
  5. In the control room, the same HMI software must support more of an "engineering workstation" look and feel. It must be possible to dynamically resize the graphical interface as one of many windows in a multi-tasking display. The graphical window shall scale so that the entire extent of the screen continue to be visible regardless of the size of the window that the user selects. There shall be no cropping of the image or the requirement to pan inside the window to access the entire image. This shall increase the control room productivity by accessing multiple related applications such as the HMI graphics, the PC programmer, etc.
- C. Alarming: The system shall provide for the asynchronous generation and management of alarms. The alarms shall be generated on a system wide basis with the ability to view and/or acknowledge any of the alarms from any of the workstations. An alarm viewer shall be available as a separate distinct application window or as an imbedded object in a general purpose graphic screen. There shall be built-in, quick-access menu selections for resorting or filtering the alarms to allow for selectively viewing subsets of the alarms. In order to facilitate access to the correct alarms, the system shall automatically filter alarms by user roles and scope of authority.
- D. Data Logging, Reporting and Historical Analysis
1. The system shall provide for the recording of historical data. This historical data shall be directly recorded into a relational database to maximize its usability. This relational database shall be a general-purpose, commercially available software product and not a proprietary data repository from the HMI vendor. The use of a general-purpose database such as Microsoft SQL Server or ORACLE shall allow the system to utilize fast-paced, market-driven access tools.



2. The system shall support the logging of individual point and alarm records. The system shall also support the "group" logging of related values, such as pump parameters directly into a database table. This shall allow for the access of data in time-sensitive packages and greatly increase the performance of historical data access.
3. The historically-logged database must be configurable to be "self-maintaining" in terms of size and data retention. The user must be able to describe maintenance actions that shall automatically purge or archive data that is no longer necessary for run time support. This shall ensure that the system does not eventually fill its disk storage and cease to operate.
4. The system shall be capable of producing a base line of production reports that include daily, weekly, and monthly reports. The reporting capability shall be based on commercially available software. This software may be inherent in the relational database product selected or it may be a separate reporting package with standard interfaces to databases. The reporting function shall not be a closed, proprietary extension of the HMI software. The use of a general-purpose reporting software shall allow the system to utilize fast-paced, market-driven access tools.

E. Trending

1. The system shall include an integrated trending capability for evaluating both short and long term analog values. All trend charts shall be imbedded into the graphical screens. Short term trends can be used to provide a dynamically changing "strip chart" look and feel to users who are monitoring real time changes in the process. Long term trends shall directly access the relational database to provide for the evaluation of values over longer time periods.
2. All trends shall allow for the dynamic addition of values and corresponding lines to the trend to allow for ad-hoc evaluation of the process. It shall not be necessary to reconfigure a graphic or switch between run time and development systems to add a line to a trend. This shall allow operators and engineering personnel to react to conditions and implement the appropriate solution.
3. The system shall also provide a "Quick Trend" option which will allow the user to point to any scalar value on any graphic, right click, and instantly create a dynamic trend of that value. This shall allow the user to do true "ad hoc" evaluation of a particular process variable.

F. Configuration and System Maintainability

1. The HMI software shall be configured primarily through fill in the blank and menu selection. Script writing shall be available for supplementing basic functionality in the form of Visual Basic for Applications. However, scripting

or other code-writing activity shall be kept to a minimum. This shall allow for faster, more-uniform development and make the system much more maintainable.

2. The system shall support dynamic configuration for all aspects of the system that are typically changed or may be added. Dynamic configuration is the ability to make changes to the underlying definition of the run time system without interrupting service to the on-going data collection and/or user support. Changes in data point configuration and/or alarm limits shall not require interruption of service to what is a continuous operation. Dynamic configuration shall include the following:
  - a. Addition of new data collection points to existing PLCs.
  - b. Modification of existing point data including address and/or alarm limits.
  - c. Creation of trend charts or modifications to existing trend charts.
  - d. Creation of graphic screens or modifications to existing graphic screens.
3. The synchronization of the HMI variable/point database and the PLC programmers' variable database shall be supported through standard manufacturer software. The addition or modification of a variable within the PLC logic shall be available to the HMI database through a simple automated process. It shall be possible to apply these changes in dynamic mode without interrupting service to the on-going data collection.

## 2.03 HMI ARCHITECTURE

- A. Overview: The overall HMI architecture shall consist of a number of PC-based workstations that utilize off-the-shelf software to provide a wide variety of application functionality. The software shall be configurable in a true client-server orientation. The following section describes the required implementation. There shall be a plant-wide system that allows for control room access to all data contained in all control devices (PLCs).
- B. Vendor: The HMI software shall be a standard off-the-shelf general-purpose software.
- C. Operating System: The HMI software shall load and run on the standard Microsoft Windows XP operating system.
- D. Architectural Functionality: Redundant Servers
  1. The primary architecture shall be supported by a pair of HMI servers. One pair of servers shall be furnished under this Contract. These HMI servers shall have the ability to perform data collection to all of the remote PLCs via an TCP/IP ETHERNET network. The servers shall communicate to each other and to additional clients/viewers via a separate TCP/IP ETHERNET network from the PC to ETHERNET network furnished under this Contract as

shown on the Contract Drawings. The network architecture is shown on the Contract Drawings.

2. The pair of servers shall act in "host" redundant mode. The HMI software shall provide through straight-forward configuration the identification of a primary and secondary server. Upon failure of the primary server, the secondary shall automatically assume primary responsibility for data collection and alarming. This coordination of servers shall provide uninterrupted access by the remote clients in terms of reading and writing of current data values to the PLCs. Upon verification of proper operating conditions of the primary, the system shall automatically switch back to the primary server.
3. This redundancy shall be accomplished using commercially available software offering supported by the manufacturer of the HMI software. In order to minimize initial engineering effort and maximize maintainability, no extensive scripting shall be required to provide for this server redundancy.
4. Each of the servers shall be fully capable of acting as a full function operator station with access to all graphics and alarming screens.
5. The operator workstations shall include any additional tools required for report customization or off-line analysis of historical data.
6. The Programming/Engineering Workstation shall have a running, licensed copy of the programming package for all of the PLCs. This workstation shall serve as the master for all PLC programs and contain on its hard disk master copies of all of the PLC programs. This workstation shall access the PLCs directly across the ETHERNET LAN that is used by the servers for data collection.
7. The system shall be supported by printers as shown. These shall be available on the client/server ETHERNET network (not the PLC data collection network) to allow for sharing of their capabilities from the distinct workstations.
8. Configuration for any of the HMI stations shall be possible directly from the control room consoles. This shall allow for the commercial acquisition of run time only licenses minimize duplication of configuration files. There shall be no reason for extensive file movement between the control room servers. There shall also be no need to write custom scripts to coordinate the configuration.

**E. Architectural Functionality - Remote Client Workstations**

1. The system shall also provide for the support of remote client workstations as follows as shown on the Contract Drawings.
2. Each of these workstations are general purpose PCs who shall act as clients to the monitoring and control system on an as-needed basis. These PCs shall access both real-time and historical data from the PLCs through the redundant servers in the control room. Each of these workstations shall have identical access to screens, alarms, graphics, and setpoint capability that is available on the servers themselves. These workstations and their respective users shall be limited in access and setpoint capability through inherent password/capability configuration of the HMI software.
3. Connectivity to the control room servers shall be via an ETHERNET LAN separate and distinct from the primary data collection ETHERNET LAN to the PLCs. These workstations shall also have access to the data collection ETHERNET LAN through a separate ETHERNET card in the PC.
4. Each of the workstations shall have a local printer which shall be ETHERNET capable to allow for sharing between the workstations.
5. The control room servers shall also be capable of supporting remote access via a dial-up modem. This access shall be facilitated using standard Windows NT Remote Access Service (RAS). RAS shall allow the serial modem line to function like a local TCP/IP connection. This connection shall allow a remote laptop to access and monitor the current status of both the HMI system and the PLCs. With proper password and privilege, the remote user shall also be able to perform setpoints and view access PLC logic. This remote access shall not require additional software products and shall not interrupt the availability of either control room server to the plant operators.

**2.04 GENERAL HMI PRODUCT REQUIREMENTS**

- A. **Scope:** This specification covers the technical requirements for a Microsoft Windows XP based SCADA system. A SCADA system exchanges data in the form of discrete and analog values from I/O devices and/or control devices such as programmable, motion or computer numerical controllers. A SCADA system also typically performs graphical display, alarming, logical functions, analysis, data handling operations and can communicate with external systems over a network.
- B. **Definitions**
  1. **HMI:** Human Machine Interface. Used to provide a graphic representation of data from a process and to accept user commands to be fed back to the process.

2. Ethernet: A very high performance local area network standard providing the two lower levels of the ISO/OSI seven layer reference model, the physical layer and the data link layer (IEEE-302.3).
3. TCP/IP: A protocol widely used across Ethernet networks for connecting computers and programmable controllers.
4. Data Concentrator: A physical device that translates analog and digital information from attached I/O devices to a protocol that can be used with an HMI.
5. Communications Protocol: A formal set of conventions governing the control of Inputs and Outputs between the two communicating processes.
6. Network: An interconnected group of nodes, a series of devices, nodes or stations connected by communications channels.
7. Operating System: A program that controls the entire overall operation of the computer system hardware/software.

## 2.05 SYSTEM ARCHITECTURE

- A. Overall Design: The software system shall be designed to operate on a variety of computer platforms and operating systems. It shall support industry standards, be modular in design, and provide application program interfaces to allow easy customization.
- B. Client/Server
  1. In order to reduce the overhead of multiple independent systems, the SCADA system shall support a distributed architecture including Human Machine Interfaces, Data Servers, and Viewers (clients). Each of these components shall work in conjunction with the others using industry standard Ethernet networks.
  2. The HMI shall support a true client server architecture. HMI Servers shall poll and collect data from devices. This data is to be seamlessly shared among other HMI Servers and to Viewers. HMI Viewers shall act as clients to the HMI Servers, seamlessly receiving their data.
  3. In a true client server environment, data is to be configured once. The HMI shall support one time configuration of data points. For example, points to be polled from a device shall be configured once on that server and other Servers or Viewers need only reference that data item to use it for their applications.
  4. Alarms shall be configured once and served across multiple HMI Servers and Viewers.

5. HMI Viewers shall be able to simultaneously access data from one or more HMI Servers. Data from multiple Servers may be used within the same graphic screen. Viewers shall require only a valid TCP/IP connection to the Server to obtain this data. This TCP/IP link may typically be across a local area Ethernet network (LAN) although it may be across a wide area network (WAN) and make use of telephone lines, radio, and/or satellite links. In this way end users shall be able to quickly and readily integrate HMIs provided by multiple vendors or suppliers. This shall be supported through a seamless interface across HMI Servers and HMI Viewers and the ability to configure data in one place yet use it in many.

C. Human Machine Interface Servers (HMI)

1. The HMI Server software shall be configurable to provide for the process monitoring and control of all points, loops, and systems through graphic display screens and hard copy (printer output) reports. These shall include but not be limited to:
  - a. Parameter Displays for signal control
  - b. Control Loop Status Displays
  - c. Real Time and Historical Data Trend Displays
  - d. Event Displays and Log Reports
  - e. Alarm Displays and Log Reports
  - f. Equipment Diagnostic Displays and Reports
2. HMI Servers shall be capable of operating independently but shall be configurable to share data with other HMI Servers on the network. In addition, Servers shall be capable of supplying data services to networked viewers.

2.06 VIEWERS

- A. Viewer Systems shall provide occasional system users with easy access to plant floor data using the same graphical user interface as HMI Servers.
- B. Viewers shall be capable of both displaying and modifying data. Viewers shall be capable of monitoring the process and access data using the latest version at time of bid of a standard Web Browser (Microsoft Internet Explorer, Netscape Navigator).
- C. The computer platform for HMI servers shall be a PC compatible personal computer running Windows NT latest version at time of bid.

## 2.07 REAL TIME DATA MANAGEMENT

- A. The software shall provide a real time, distributed, memory resident database of current process data values. These data ("point" or "tag") values may be from definable device points representing the value of a physical data collection item on a resource, or virtual points representing values calculated from one or more device point values used in a mathematical expression.
- B. Math and Function Support
  - 1. The following math and logic capabilities are required.
    - a. Event Driven Math and Logic
    - b. Visual Basic compliant scripting language support
    - c. Logical operators (and, or, compares, etc.)
    - d. Alarm Status
    - e. Timers
    - f. Four Function Math (+, -, /, \*)
    - g. Exponential and Logarithmic
    - h. Statistics (average, mean, min, max, median, etc.)
    - i. Trigonometric (sine, cosine, etc.)
    - j. Bit manipulation
    - k. String functions
    - l. Conversions (BCD, ASCII, etc.)
- C. Data Sharing
  - 1. Point values shall be stored, retrieved and manipulated across one or more computers using the software's distributed architecture. Data integrity must be automatically and continuously ensured.
  - 2. Writing of custom software shall not be required to provide simple data sharing among HMI Servers, and/or Viewers. Viewers shall simply "connect" to Servers to obtain data.
  - 3. Application program interfaces shall be published and available to permit users to write custom software to support interfacing the HMI and Servers to other computer systems and applications. To ensure that these "APIs" provide adequate support for device data collection, the HMI supplier shall use these APIs in the implementation of the HMI itself.
  - 4. The HMI shall also support data sharing using DDE. In this mode, the HMI acts as the "server" and applications such as Microsoft Excel act as the "client".

**D. Data Collection Methods**

1. Data collection methods shall including scheduled polling, on-change, unsolicited, timed interval, "on demand", triggered reads, and array support, among others. Engineering Unit conversions on collected data and reverse engineering units conversions for setpoints are required.
2. HMI Servers shall have configurable support for obtaining data from supported plant floor devices.
3. Application program interfaces shall be published and available to permit users to write custom software to support additional devices for data collection. To ensure that these "APIs" provide adequate support for device data collection, the HMI supplier shall use these APIs in the implementation of the HMI itself.
4. The HMI shall also support data collection from DDE servers using both the DDE and Advance DDE protocol standards. In this mode, the HMI operates as a client. This capability permits the use of third party software to extended data collection support.

**E. Required Data Types**

1. The following Data Types shall be supported:
  - a. Global
  - b. Floating point
  - c. Analog (Signed and Unsigned)
  - d. Discrete
  - e. String
  - f. Arrays
  - g. Structures

**F. Device Communications**

1. The HMI must be capable of supporting hundreds of different models, makes, manufacturers, and protocols of programmable and industrial control devices. Support for the following PLCs shall be included as a minimum:
  - a. GEFANUC
  - b. Allen Bradley
  - c. Modicon

The protocol shall be Ethernet TCP/IP; no other protocols will be accepted.

2. The HMI shall also support use of DDE servers to provide device communications.



3. PC I/O drivers shall not require the use of proprietary hardware for Ethernet TCP/IP communications.

## 2.08 APPLICATION MODULES

- A. The SCADA system shall be implemented in a modular fashion with a "base" module and one or more "option" modules. Use of option modules shall require the use of the base module. Multiple option modules may be combined with the base module to provide additional functionality.
- B. Graphical User Interface/Status Process Monitoring:
  1. The Graphical User Interface shall provide a set of tools for graphically representing process status. A graphic editor shall be provided to enable creation of graphic screens to represent current process information.
  2. For ease of use, the editor shall include cut & paste as well as drag and drop support within a single window and among multiple windows and shall include undo/redo support. Support for grouping and ungrouping sets of objects and for readily editing them while grouped are to be included. Object alignment and spacing tools are required so those objects can be properly arranged on the screen.
  3. The editor shall include a utility or tool for determining which points are referenced in a screen, which objects reference them, and which points are not currently defined or known to the software. This tool shall also include provision to search and replace point names - for both single objects and groups of objects.
  4. A test animation capability shall display the screen currently being developed in the run time environment for rapid prototyping and testing.
  5. The editor software shall include the ability to Create/Edit Points from within the Editor. It shall also be possible to browse the network to locate computers and projects for available points. The editing package shall include a Wizard/Symbol/Object Library to permit the inclusion of pre-developed or third party graphic objects.
  6. A procedure editor shall be included to control setpoints and to perform window management. The graphic editor shall include a scripting expression editor to develop application logic.
  7. Graphic objects on these screens shall be linked by name to actual device and virtual data through the distributed point database. Objects on the graphics screens shall be configured with animation features, causing them to change color and/or position. Text information shall be printed to the screen alerting

personnel to current point status. Objects shall be dynamically scalable - both horizontally and vertically.

8. The software shall support the following dynamic attributes:
  - a. Annunciation, movement, blink, rotation, and fill (unidirectional and bi-directional)
  - b. Gradient fill
  - c. Object border animation
  - d. Object visibility
  - e. Transfer tags for screen transfer or popup windows
  - f. Procedure tags to invoke user defined scripts/programs
  - g. Object and or application help screens
  - h. Alarm information
  - i. Trends charts
  - j. Setpoint tags for point value changes
  - k. Animated frames that can include other graphic objects
  - l. Zoom to Best Fit, Resize Window to Zoom
  - m. Automatic font scaling when changing window sizes
  - n. 1.5 Million Colors
9. Graphic objects shall include:
  - a. Imported metafile objects
  - b. Embedded OLE, including ActiveX objects, sound, video, clip art, spreadsheets, etc
  - c. SPC charts
  - d. Trend charts
  - e. Historical Data displays
  - f. Alarm displays
  - g. Arcs
  - h. Lines
  - i. Circles
  - j. Ellipses
  - k. Lines
  - l. Polylines
  - m. Polygons
  - n. Rectangles
  - o. Text strings
  - p. Buttons
10. Tag types shall include:
  - a. Constant - downloads constants to a point
  - b. Variable - allows operator input of desired value
  - c. Ramp - downloads values in configured increments

- d. Slide - increment/decrement of point values
  - e. Toggle - sets digital points to opposite state
11. Graphics screens shall support a Visual Basic compliant scripting language. Data items and variables can be manipulated by the screen scripting to provide additional functionality in dynamically controlling screen characteristics.
  12. The graphical editor and viewer shall be capable of being an ActiveX container. It shall be capable of using ActiveX objects provided with the HMI package or third party ActiveX controls supplied by others.
  13. The graphical user interface shall support ActiveX "methods" to allow the user to interact with ActiveX control objects. Interaction may be through the association of a method to a button or object, which the operator initiates, or methods may be used by the Visual Basic compliant scripting language for advanced functionality and additional control of the ActiveX components.

#### C. Alarming

1. The software shall provide alarm annunciation and routing capabilities. The alarm text associated with each alarm shall be user configurable. Alarms are to be applied as follows:
  - a. Digital Points - the alarm generating condition (0 or 1) shall be selectable.
  - b. Analog Points - the alarm generating conditions shall be evaluated based on alarm criteria selected:
    - (1) Absolute - There shall be two levels of high alarming, HI-1 and HI-2, and two levels of low alarming, LO-1 and LO-2. HI-1 and LO-1 are also known as warning alarms. For high alarming, an alarm shall be generated when the point value reaches or exceeds the value specified for HI-1 or HI-2. For low alarming, an alarm shall be generated when the point value reaches or falls below the value specified for LO-1 or LO-2.
    - (2) Deviation - Alarm limits for deviation alarms shall be given in positive values. The HI-2 and HI-1 alarms shall be generated when the difference between the current point value and the Deviation Point value is positive and reaches or exceeds the specified limits. The LO-1 and LO-2 alarms shall be generated when the difference between the current point value and the Deviation Point value is negative and the absolute value of the difference reaches or exceeds the specified limits.
    - (3) Rate of Change - Rate of Change alarms shall be provided to detect either a faster or slower than expected change in the value of a point.

- (4) Duration - The Alarm Display shall include total time in alarm state.
  - (5) Alarms shall be configurable to be filtered and asynchronously sent to users based on user role and scope of responsibilities.
- 2. Alarms shall be configurable with respective priorities, divided into classes, and color-coded for display. There shall be user defined logging criteria, user-defined acknowledgment and deletion criteria, user-specific textual messages and operator help text. The alarm list can be toggled between dynamic and static display and quickly filtered to limit the current view to a particular alarm set of interest.
  - 3. The system shall support "alarm blocking". Users shall be able to define an alarm hierarchy and block the generation of "lower level" alarms if a "higher level" alarm is present. This allows operators to concentrate on primary causes rather than receive all the resulting secondary problems. For example, if a conveyor stops then all machines feeding it would also stop. The operator needs to determine why the conveyor stopped - the operator does not need to see the other alarms. In this example, fixing the conveyor shall fix those alarms as well.
  - 4. The system shall provide for an automatic routing of configured alarm messages to display type pagers. The routing shall be configurable as to personnel or pager ID receiving the message. It shall be possible to upgrade the paging system to support dual outputs - allowing messages to be sent to local pagers, or to a dial-up paging system.

#### D. Data Logging and Reporting

- 1. Data collected by the Process Monitoring and Control System shall be logged into a relational database to support historical reporting and analysis. The system shall support multiple SQL compatible databases and/or formats. Configurable logging of points, alarms, and events shall be supported without forcing the application developer to understanding database internals. Custom application software must not be required to log data. Configuration of the logging characteristics of a point shall automatically configure the database that shall store the data. A variety of database management systems shall be available for use.

2. Point and alarm data is to be logged upon a "trigger" event. The following triggers for logging point and alarm data are required.

Point Data	Alarm Data
At Time of Day	On Generation
On Time Interval	On Reset
On Point Update	On Acknowledgment
On Event	On Deletion
Gated Based on Logical Expression	

Point attributes, which shall be available for logging, include

- a. Point Value
  - b. Previous Value
  - c. Raw Value
  - d. Alarm State
  - e. Resource
  - f. Time Last Logged
  - g. Engineering units
3. The logging module shall support the logging of multiple point attributes into a single record based on a single trigger. The logging module shall also support logging multiple points and their attributes to a single table. The logging module shall support the simultaneous logging of multiple tables of data consisting of combinations of single points, multiple points, alarms, and events. This supports the creation of custom database tables unique to an application.
4. Through configuration alone, the logging utility shall support "store and forward" to selected database management products. Data shall be buffered on the node collecting it and automatically forwarded to the node where it is to be logged. During a communications outage between the two nodes, the data collection node shall continue to buffer data. Upon restoration of communications, the data collection node shall automatically forward the buffered data to the logging node for storage.
5. User configurable database maintenance actions, which are executed automatically, based on database size or number of records shall be supported. Examples of these actions include exporting data to a CSV file then purging the records from the database. No custom software shall be required to implement this support.

6. A set of standard reports shall be provided for generation. Reports shall provide a tool to summarize logged data for data analysis. Reports shall be configurable to be automatically printed and/or stored in the computer. The software shall have the ability to generate reports on the following basis:
  - a. At Time of Day.
  - b. Periodically at a Specified Interval.
  - c. On Event.
  - d. Manually Triggered.
7. Additional reports using the logged data may be generated using standard third party database management tools such as spreadsheets and report writers.

**E. DDE Client and Server Interface**

1. The HMI shall support a DDE interface in both client and server modes. In the server mode, DDE aware applications (clients) such as Microsoft Excel shall be able to access data managed by the Process Monitoring and Control System. The DDE client interface support the use of third party applications to monitor, analyze, report, and modify point data.
2. Required Services for the HMI server support include:
  - a. Request Point Configuration Data (e.g. alarm limits, engineering units labels)
  - b. Request Point On-Change (DDE Peek)
  - c. Request Point Update (DDE Poke)
3. In the client mode, DDE server applications such as device communications drivers shall be able to act as a source of data to the HMI, for both reading and writing of data down to factory floor devices or external systems. For maximum flexibility in selecting third party servers and for maximum software performance, the HMI shall support both the DDE and Advance DDE protocols.

**F. Application Development**

1. Application development shall be done in the context of a "project". A given system shall support concurrent application development and execution of multiple projects. All the data related to a project including communication ports, field devices, alarms, users, and graphic screens is stored in a project folder. Project folders shall be easily transportable from system to system. Configuration of a project shall be fully dynamic so that objects may be added to or modified within the project without requiring a system restart.

2. System shall be furnished with application development tools for configuring projects. Utility shall provide for interactive fill-in-the-blank transactions for configuring individual items as well as a Configuration Wizard which guides a developer through the entire process.
3. To support rapid configuration of large systems, an import/export utility shall be provided to allow for external management and replication of configuration data. This external file format shall be CSV format to facilitate the use of standard tools such as MS Excel and MS Access.
4. An interactive Graphics Editor package shall be required to develop screen layouts and to animate a given application.
5. In cases where standard software functions do not support a given requirement, a set of documented application programming interfaces (API) shall be available for developers. APIs shall be C language or Visual Basic (see earlier section).

G. Data Trending

1. The trending module shall be capable of supporting one or more embedded trends within the run time graphics user interface. The following types of trends shall be supported:
  - a. Trends with Multiple Y Axes
  - b. Trends with Multiple X Axes
  - c. Trends-with multiple time periods
  - d. Reference curves
2. The trending option shall support display of an unlimited number of pens on a single trend chart. Each pen shall display either dynamically updating data or provide seamless access to historical values based on user request. In addition, user shall be able to compare data from different time periods.
3. Trending shall support the creation and re-display of files with reference data from the currently displayed trend. This export capability shall produce "CSV" format files so as to be compatible with standard office automation tools such as spreadsheets and databases.
4. Users shall be able to analyze trend data by scrolling through time, changing the range for point displays, zooming into an area of the trend and selecting a new time period to display.
  - a. Printing of trend charts is required.

5. The trending module shall support reading data from "CSV" files for the display of data collected or generated by other applications within the HMI framework.
6. Trend layout shall be highly configurable including colors, tick marks, legends, title, and fonts. The update rate for data being displayed from log files shall be configurable. The data being trended shall be configurable. This configuration shall be modifiable at run time without requiring a development system or license.
7. Trend data can be supplied from multiple sources including current point data, data from CSV files, and data logged to a database. Data displayed by the trend manager shall support time-based or on-change based sampling.
8. Trending shall support the display of array points. Arrays can be interpreted as independent variables or as a time series of a single variable. The latter case supports buffering of data in high speed sampling applications.

#### H. Equipment Control

1. The SCADA system shall provide the capability to configure logic and schedule events based on the following criteria:
  - a. Time of day
  - b. Time Interval
  - c. Production event
  - d. Point change
  - e. Alarm Generation
2. In response to configured events, the system shall invoke configurable actions that include:
  - a. Log Event
  - b. Acknowledge Alarms
  - c. Enable/Disable an Alarm
  - d. Recipe Upload/Download
  - e. Execute a Script
  - f. Set a Point Value
  - g. Copy a Point Value
  - h. Execute a Procedure
3. Scripts shall be modular and re-usable. Scripts shall be in a Visual Basic compliant language.

An event editor shall be included to permits users to configure, monitor and debug applications.



4. Users shall be able to monitor the progress of control programs and dynamically modify their operating characteristics. The event editor shall at least support these debug tools:
  - a. Run in Single Step Mode Start/Stop Scripts
  - b. Set Break Points
  - c. Step into or Over Sub-Scripts
  - d. Watch variables change
5. Control programs shall have access to all of the application programming interfaces (APIs) within other SCADA applications such as DDE interfaces, equipment/device interfaces, production tracking, and system alarming and logging.

PART 3 EXECUTION (Not Used)

-END OF SECTION-

**Section 17250**  
**SCADA SYSTEM - PLANTWIDE NETWORK EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, test, and place into satisfactory operation all network equipment specified herein and on the Contract Drawings. Network equipment, furnished by the Contractor, shall include, but not be limited to: Ethernet rail switches, wireless access points and network management system components.

**1.02 RELATED SPECIFICATIONS**

- |    |               |   |  |
|----|---------------|---|--|
| A. | Section 14511 | - | Container Transport System                           |
| B. | Division 16   | - | Electrical, various sections and as modified herein. |
| C. | Section 17101 | - | SCADA System - General Requirements                  |
| D. | Section 17210 | - | SCADA System – Operator Workstation                  |
| E. | Section 17212 | - | SCADA System - Programmable Logic Controllers        |
| F. | Section 17320 | - | SCADA System - Control Panels and Enclosures         |

**1.03 QUALITY ASSURANCE**

- A. A single manufacturer shall furnish all network equipment provided under this contract except as otherwise noted.
- B. References
- |    |             |   |                            |
|----|-------------|---|----------------------------|
| 1. | IEEE-802.3  | - | Ethernet Standard          |
| 2. | IEEE-802.11 | - | Wireless Ethernet Standard |
| 3. | UL 1950     | - | Underwriters Laboratory    |

**1.04 SUBMITTALS**

- A. Comply with requirements of Specification 17101.

**1.05 DESIGN REQUIREMENTS**

- A. All network equipment shall be of first class workmanship and shall be entirely designed and suitable for the intended services. All materials used in fabricating the equipment shall be new and undamaged. All network switching equipment shall meet the requirements of UL 1950, FCC Class A.
- B. The network infrastructure shall be installed in the facility as shown.

- C. Ethernet rail switches shall be DIN rail mounted and shall be installed with power supplies and surge suppressors as shown or specified. The LAN shall utilize Ethernet rail switches to form a redundant ring with dual uplinks. Install the Ethernet rail switches as shown to form the facility wide global network.
- D. The network topology shall be switched 10/100 Mbps Ethernet to each attached device, interconnected via Ethernet switch modules.
- E. Global communication between devices on the network shall be encapsulated for inter-switch transmission, and unencapsulated at the far-end switch as needed.
- F. Redundant management/controller modules in the chassis shall be installed to maintain backplane timing and management functions. If one module fails or is removed, the other shall immediately take over and continue processing packets from the network.
- G. All equipment in the infrastructure shall support SNMP (Simple Network Management Protocol) for detailed management functionality.
- H. All 100 BASE-FX and Ethernet rail switch network equipment will accommodate multimode 62.5/125 fiberoptic cable connections.
- I. Wireless access points shall feature a modular design allowing future upgrades to provide a scalable solution with complete backward compatibility for legacy clients.
- J. A wireless Ethernet network shall be provided to connect the container transport system to the LAN, as shown and as specified in Section 14511 - Container Transport System. Wireless access points shall be connected to the Ethernet rail switches to extend connectivity to the wireless clients throughout the facility. A minimum number of wireless access points shall be installed in the facility as shown.
- K. A radio study shall be performed to determine the coverage area of the wireless network. Provide 4 additional wireless access points as spare parts. Install up to 2 additional wireless access points as indicated by the radio study to ensure that the radio frequency losses are compensated such that all clients within the coverage area defined herein communicate to the LAN with a transfer speed of at least 24Mbps. Any additional wiring and conduit shall be included under this section.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements of Section 17101.

## 1.07 NETWORK COMPONENTS

### A. Equipment

1. Ethernet rail switches
2. Fiberoptic cable (Division 16)
3. Fiberoptic patch panels
4. Ethernet switch modules
5. Redundant power supplies
6. Wireless access points

- B. Additional items as recommended by equipment manufacturers or as described elsewhere in the Specifications shall be provided.

## PART 2 PRODUCTS

### 2.01 POWER SUPPLIES

- A. Dual power supplies shall be furnished installed for each Ethernet rail switch chassis to prevent a single power supply failure from rendering a portion of the network inoperable.
- B. Dual power supplies shall be powered from 120 Vac, 60 Hz. Provide two battery-backed rail mounted 24 Vdc power supplies. Size batteries to provide at least 10 minutes of reserve capacity.
- C. Dual power supplies shall be mounted in the networking enclosure and shall be sized for the network equipment furnished.

### 2.02 ETHERNET RAIL SWITCHES

- A. Ethernet rail switches shall be provided to form the LAN as shown or specified.
- B. Each network access point shall be provided with an enclosure to house the rail switch and all networking components required for a complete system.
- C. A wall mounted external (to network access point) or rack mounted internal fiberoptic patch panel with sufficient capacity to terminate all fibers of all cables shown at each network access point shall be provided. The Ethernet rail switch shall be connected to the patch panel via factory made jumper cables installed in conduit.
- D. Ethernet rail switches shall meet the following design requirements:
1. Backbone ports consisting of two pair of multimode duplex SC fiberoptic ports operating at 100 Mbaud.

2. Operating power shall be 24Vdc.
  3. Media redundancy of less than 300 ms.
  4. Five auto-sensing Rj45 type TP/TX ports.
  5. Operating temperature range of 0° to 60°C.
  6. Hirschmann Model RS2-FX/FX or approved equal.
- E. Additional Ethernet switch modules shall be provided at each Ethernet rail switch where required. Provide sufficient Ethernet interfaces at each rail switch to provide the required Ethernet interfaces as shown with at least 2 spares.
1. Ethernet switch modules shall operate on 24Vdc.
  2. Ethernet switch modules shall be from the same manufacturer as the Ethernet rail switch.
  3. Ethernet switch shall have a minimum of 8 auto-sensing 10/100 Base-T ports.
  4. Operating temperature range of 0° to 60°C.
  5. Hirschmann Model RS2-TX/TX or approved equal.
- F. Where shown installed in the Foreman's Office or in the Operations Room console, Ethernet switches shall meet the requirements specified above, but shall be of the rack-mounted type.

## 2.03 PATCH PANELS

### A. Fiberoptic Patch Panels

1. Rack-mounted fiberoptic patch panels:
  - a. Capacity for 24 connectors and splices.
  - b. Universal mounting brackets for 19 and 23 inch EIA relay racks and cabinets.
  - c. Modular splice tray shall accommodate splicing for fusion and mechanical splices.
  - d. Provide access from the front, rear, left and right sides.
  - e. Panels shall be manufactured from 16-gauge, cold rolled steel.

- f. Panels shall be provided with grounding and strain relief lugs to support the fiber cable.
  - g. Provide cable tie-down support islands to take up excess fiberoptic cable and insure it does not exceed its maximum bending radius.
  - h. Provide cable bulkhead adapters pre-mounted on four plates, six connectors per plate (dual fiber connectors count as two). Provide type ST connectors.
  - i. Panel dimensions shall not exceed 6 inches in height and 12 inches in depth.
  - j. Panels shall be inspected to assure that there are no sharp edges which could damage the fiberoptic cable.
  - k. Where shown mounted in the Foreman's Office console and the Operations Room console, rack-mounted patch panels shall be installed.
2. Wall-mounted fiberoptic patch panels
- a. Capacity for 24 connectors and splices.
  - b. Universal mounting brackets for wall or side of network access panel.
  - c. Modular splice tray shall accommodate splicing for fusion and mechanical splices.
  - d. Provide access from the front and at least one side.
  - e. Panels shall be manufactured from 16-gauge, cold rolled steel.
  - f. Panels shall be provided with grounding and strain relief lugs to support the fiber cable.
  - g. Provide cable tie-down support islands to take up excess fiberoptic cable and insure it does not exceed its maximum bending radius.
  - h. Provide cable bulkhead adapters pre-mounted on four plates, six connectors per plate (dual fiber connectors count as two). Provide type ST connectors.
  - i. Panel dimensions shall not exceed 6 inches in height and 12 inches in depth.
  - j. Panels shall be inspected to assure that there are no sharp edges that could damage the fiberoptic cable.

B. Product Manufacturer: Provide patch panels of one of the following:

1. Net Optics
2. Corning Cable Systems
3. Or approved equal

2.04 WIRELESS NETWORK

A. General: A wireless network shall be provided to provide connectivity to the container transport system shuttle cars as specified in Section 14511.

1. Coverage area for the shuttle car wireless network shall include the entire path of each car.

B. Wireless Access Points

1. Wireless access points shall provide dual connectivity supporting both IEEE 802.11b and IEEE 802.11g wireless Ethernet clients.
2. Security: Provide support for 802.1x including EAP via secure tunneling with Microsoft Challenge Authentication Protocol Version 2 and EAP- Subscriber Identity Module to yield mutual authentication and dynamic, per-user, per-session encryption keys. Additionally, provide support for MAC address and standard 802.11 authentication mechanisms.
3. Encryption: AES-CCMP, TKIP, message integrity check (MIC) and broadcast key rotation. Provide support for static and dynamic IEEE 802.11 WEP keys of 40 and 128 bits.
4. Install in NEMA 4X enclosure.
5. Provide support for installation in environmental air spaces, UL 2043 approved.
6. Support power over Ethernet and direct connection. Connect with CAT-6 cable providing power and communication to Ethernet rail switches. Provide power supplies and connectors at rail switches.
7. Frequency: 2.412 to 2.462GHZ with 11 channels.
8. Modulation: direct sequence spread spectrum.
9. Range: 110 feet @54 Mbps outdoor and 90 feet @ 54 Mbps indoor.
10. Manufacturer: Cisco Aironet 1200 series or approved equal.

## PART 3 EXECUTION

### 3.01 REQUIREMENTS

- A. The Contractor shall provide, install and test all network equipment under this Contract.
- B. Assign IP address pool to server utilizing addresses from 10.1.1.1 to 10.1.1.255.
- C. Enable wireless access point 128 bit encryption.
- D. Submit Network Configuration Report including a listing of all client computers, their configurations, and all passwords and codes. Include all software installed on each computer or PLC along with custom system restoration disks containing all supplemental programs and data files necessary to restore the computer to operational status after reformatting of its hard disk drives.

### 3.02 FIELD TESTS

- A. After installation of the equipment, controls and all appurtenances, the Contractor shall field test the equipment for system operation and conformance to the specified performance parameters. The Contractor shall perform field tests in accordance with Section 01811 - Preliminary and Final Field Tests.
- B. After installation of the base wireless network, the signal strength shall be verified along the defined coverage area. Any locations that do not have sufficient signal strength to allow the wireless client to operate a data transfer rate of at least 24 Mbps, shall be compensated by adding additional wireless access points to the system as indicated by the radio test. Submit test results along with verification that the communication system meets the contract requirements throughout the coverage area as defined herein. Upon installation of any additional wireless access points, an additional radio verification test shall be performed and its results submitted for verification.

### 3.03 MANUFACTURER'S FIELD SERVICES

- A. The Contractor shall provide the services of factory certified technicians who shall adequately supervise the installation and testing of all equipment under this Contract and instruct the Contractor's personnel and the City of New York's personnel in its maintenance and operation.
- B. The Contractor shall provide equipment start-up services and training in accordance with Section 01821 and as described in Detailed Specification 17101.



- C. The Contractor shall provide the services of the manufacturer representative for the following minimum durations:
- |  |                        |
|--|------------------------|
| 1. Equipment Installation and Inspection | 3 visits of 1 day each |
| 2. Field Tests                           | 6 visits of 1 day each |
| 3. Initial Operation                     | 3 visits of 1 day each |
| 4. Training                              | 3 visits of 1 day each |
- D. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Commissioner on each day of arrival at the project.
- E. TCP/IP Address Assignments: Networking services shall be installed for each Personal Computer (PC) workstation, Server, Operator Interface Terminal (OIT) and Ethernet LAN connected Programmable Logic Controllers, Container Shuttle Cars provided. Networking services shall include assignment of IP addresses. All IP addresses shall be assigned and coordinated by each contract from a designated pool of addresses. The following networking components shall be installed and fully configured:
1. Client for Microsoft Networks
  2. NETBEUI
  3. Network Interface Card support
  4. TCP/IP protocol
  5. TCP/IP printing
- F. Programmable Logic Controllers and other intelligent devices that are connected to the network shall communicate via TCP/IP protocol. IP addresses shall be assigned using DHCP from the file server or router.

-END OF SECTION-

**Section 17260**  
**SCADA SYSTEM - LASER PAGE PRINTER**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install, calibrate, test, startup, and place into satisfactory operation one laser page printer at each transfer station.

**1.02 SUBMITTALS**

- A. The Contractor shall comply with the requirements specified in Section 17101 and include the following information in the submittal for this section:

1. Data sheet and catalog literature
2. Interface and cable data

**1.03 MAINTENANCE**

- A. The Contractor shall provide the following expendables at each site:

1. Four (4) replacement toner cartridges
2. Eight (8) 5,000 sheet (ten 500 sheet packages) boxes of 20 pound, plain white, 8.5 by 11 inch paper for each device the Contractor shall provide
3. Four (4) 5,000 sheet (ten 500 sheet packages) boxes of 20 pound, plain white, 11 by 17 inch paper for each device the Contractor shall provide

**PART 2 PRODUCTS****2.01 LASER PAGE PRINTER**

- A. The Contractor shall furnish Laser Printers which meet the following requirements:

- |                      |   |
|----------------------|---|
| 1. Printing:         | Electrostatic print drum                              |
| 2. Print Speed:      | Twenty-one (21) pages per minute                      |
| 3. Print Modes:      | Portrait and landscape                                |
| 4. Typefaces:        | 80 built in scalable PCL and 80 internal postscript   |
| 5. Print Resolution: | 1200 x 1200 dots per inch                             |
| 6. Memory:           | 32 Mbytes, expandable to 192 Mbytes                   |
| 7. Print Language:   | HP PLC6, HP PLC5e and Adobe postscript level 2        |
| 8. Paper Feed:       | Three trays   |
| 9. Paper:            | Plain paper sizes: 8.5 x 11 inches and 11 x 17 inches |

- 10. Noise Level: Not to exceed 55 dB as measured 2 feet from the unit in any direction
  - 11. Mounting: Desktop
  - 12. Quantity: One (1)
- B. The Contractor shall provide a printer which is "network ready", with a pre-installed network interface card to allow easy connection to an Ethernet-based local area network. Include any related network printer management utilities.
- C. The Contractor shall provide cables and any other required devices to connect the printer to an Ethernet-based local area network.
- D. Product and manufacturer: Provide one of the following:
- 1. LaserJet 5100tn, as manufactured by Hewlett-Packard
  - 2. Or approved equal

### PART 3 EXECUTION

- 3.01 The Contractor shall install printer according to manufacturer's instructions.

-END OF SECTION-

**Section 17270**  
**SCADA SYSTEM - MONITORING AND CONTROL CRITERIA**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide the services of the SCADA System Supplier, as described in Section 17101 - SCADA System - General Requirements, to load, configure, develop, test, document and place in satisfactory operation all software associated with the SCADA System and all its ancillary devices, as described herein, required by other sections, indicated on the Contract Drawings and as necessary to provide a properly operating and integrated system.
- B. In general, the software packages the Contractor will be required to furnish, install, customize, configure and develop shall include but shall not be limited to:
  - 1. Workstation and Server Operating Systems
  - 2. Workstation and Server Networking Software
  - 3. Workstation and Server Data Management Software (Spread sheets, Databases, Word Processing, etc)
  - 4. Workstation and Server Utility Programs (Virus scan, remote communication, etc)
  - 5. PLC Ladder Logic Development and Documentation Software
  - 6. PLC Ladder Logic Application Software
  - 7. PLC Specialty Software and Programming Languages

**1.02 RELATED SPECIFICATIONS**

- A. Section 17101 - SCADA System - General Requirements
- B. Section 17210 - Operator Workstations
- C. Section 17250 - SCADA System - Plantwide Network
- D. Section 17280 - SCADA System - I/O Points List
- E. Section 17600 - SCADA System - Control Strategies

### 1.03 REFERENCES AND CODES

- A. The following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern nomenclature; define parameters of configuration and construction, in addition to specific details in this Specification and the Contract Drawings:
1. ISA, Instrument Society of America
  2. API, American Petroleum Institute
  3. UL, Underwriters' Laboratories, Inc.
  4. NRC, Nuclear Regulatory Commission
  5. NEMA, National Electrical Manufacturers Association
  6. OSHA, Occupational Safety and Health Administration
  7. ANSI, American National Standards Institute
  8. MIL, Military Standards
  9. NFPA, National Fire Protection Association
  10. SAMA, Scientific Apparatus Manufacturers Association
  11. JIC, Joint Industrial Council
  12. IEEE, Institute of Electrical and Electronic Engineers
  13. NEC, National Electrical Code
  14. FM, Factory Mutual

### 1.04 SUBMITTALS

- A. The Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Commissioner in accordance with the requirements of Section 17101 - SCADA System - General Requirements and Section 01300 - Shop Drawings.
- B. The Supplier shall submit, through the Contractor, the following information for approval prior to beginning actual work developing software for the project:
1. Qualifications and certifications of system software engineers
  2. A listing of all proposed software packages indicating quantities and where they will be installed
- C. The Supplier shall submit all completed items to the Commissioner for record drawings. As a minimum, the items to be submitted shall include but shall not be limited to:
1. PLC ladder logic with full documentation and annotation
  2. A full color copy of each graphic display screen (do not provide typicals)
  3. Screen animation and control
  4. Databases
  5. Alarm and event log lists, formats and messages

## 1.05 SCADA SYSTEM MONITORING AND CONTROL SYSTEM SOFTWARE

- A. For the purposes of this section, the term workstation shall be used to indicate all computers used for operator interface, data acquisition, archiving, alarming and control. These shall include, but not be limited to, desktop/tower type PCs, console-mounted PCs, network servers, NEMA rated operator interface units/terminals and all local operator interface terminals.
- B. A single software package shall be used for all workstations throughout the project. Once installed and operating and the project completed and accepted, all licenses, media, documentation and packaging shall be turned over to the City of New York. It is the responsibility of the Contractor to maintain all items entrusted to him in excellent condition. Any damaged items or items not turned over, shall be replaced at the Contractor's expense.
- C. It shall also be the responsibility of the Contractor, through the services of the Supplier to install, setup, configure and place in optimum working order the HMI Software as well as all other software referenced herein. All software shall be installed and configured, with strict adherence to manufacturer's recommendations and the requirements of this specification, on all workstations supplied under this Contract.

## 1.06 QUALITY ASSURANCE AND QUALIFICATIONS

- A. Personnel: The Supplier shall utilize system and software engineers who have been factory trained and certified on the respective software packages, to perform all programming functions, develop control strategies, create graphic displays, customize applications, document all work and coordinate the software interface. They shall be intimately familiar with the details of this project, wastewater treatment facility instrumentation and control in general and the project goals and requirements.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 GENERAL CONTROL PHILOSOPHY

- A. In order to provide the most reliable and fault tolerant system of control and monitoring, a distributed approach to programming shall be implemented.
- B. All control logic, loop control, critical alarming and I/O shall be done at the local PLC level.
- C. Local workstations shall contain the database for their attached PLCs. Remote workstations shall access needed data from the respective local workstation as shown.

- D. Workstations shall send only valid data to the PLC where it shall be "latched in" until such time as new valid data is made available. A failure of the workstation shall not prevent PLC from continuing to function normally using the last valid data it received.
- E. All workstations, PLC's and network components, shall be monitored for failures through the use of "watchdog timers" programmed into the software. Failure of any component shall be alarmed and annunciated at the next level of control and the information shall be immediately made available on the network. Provide for RS232 connections from PLC's and workstations to Uninterruptible Power Supplies (UPS's) so that items identified in Section 17370 are monitored at the Operator Workstation (OWS). All configuration and drivers required shall be provided.
- F. Workstations shall monitor and display all digital and analog data available on their connected PLCs and all pertinent data available on the plant-wide network. Where possible, the software shall be configured to verify the validity of that data. Data that is in disagreement or out of valid range shall indicate as such through the extensive use of displays and alarms.

### 3.02 PLC PROGRAMMING CONVENTIONS

#### A. General

1. All logic, sequencing, interlocking, safety and critical alarm and control shall be implemented at the PLC level using ladder type logic. Individual "rungs" shall be provided for each logic function. Subroutines shall be used where repetitive logic is required. Alarm logic shall not be performed in subroutines as they may not be active at all times.
2. Commands such as start, stop, open, close, operating mode, sequence selection, etc, that are sent from the workstation by operator initiative or response, shall be "pulsed" and "latched" into the PLC logic.
3. All analog loop control such as temperature, flow or level shall be performed at the PLC level, not in the workstation. All calculations and logic necessary to keep an individual loop in operation, in the event of failure of communication with the workstation, shall also be done in the PLC.
4. All data points, both analog and digital, associated with the PLC based control, shall be available to the operator at the workstation and fully displayed and adjustable (where possible).
5. The PLC ladder program shall be written so that the operator, via a local or remote workstation, can select the mode in which he wants each individual control loop to operate (i.e. manual/auto). He shall also be able to view and manually adjust all parameters such as setpoint or output from the

workstation. Once entered, the valid data shall remain stored in the PLC until such time as new valid data is received.

#### B. Program Structure

1. All programming shall be implemented using ladder logic style programming only. Other styles of programming shall only be used with the prior written permission of the Commissioner and only when the task cannot be performed using ladder type logic.
2. The program shall be written using a well organized and well documented structured approach. All common elements shall be grouped together as much as possible. For example, all logic for a single piece of equipment such as start/stop logic, indication, fault and alarm logic shall be grouped together to allow easy startup and trouble shooting.

#### C. Safeties and Interlocks

1. Upon initial startup or a subsequent restart of the PLC, the program shall be written to first initialize all logic and data; next, bring all equipment and controls to a safe and ready status as allowed by safety and interlock status and only then allow equipment to be started as indicated in the individual control strategies. When the system has decided that all conditions are satisfied, it shall then issue a "ready" status for each piece of affected equipment, for display by the HMI.
2. Upon startup or restart of equipment and/or systems after a power failure, the program shall retain the status of all equipment prior to the interruption. Upon restoration of stable power, with a suitable and adjustable time delay on each piece of equipment, the program shall check the status of all controlled equipment and systems for faults and/or safety trips and only then allow equipment to be started as indicated in the individual control strategies. Items indicating a faulted or unsafe condition shall be immediately locked out and the appropriate alarms generated for display by the HMI.
3. Where at all possible, all preset values (for timers, counters, etc.) and variables shall be stored in register memory and shall be made available to the operator at the HMI for both display and adjustment.

### 3.03 WORKSTATION PROGRAMMING CONVENTIONS

#### A. General

1. The operator interface to the System Software shall be through an organized system of graphic displays and tabular data displayed on the workstations and interface units throughout the system. In general the graphic displays shall be based on a schematic representation of the process, as shown on the Contract



Drawings and general equipment arrangement. While only one of each type of equipment may be depicted on the Drawings, all equipment, instrumentation and devices shall be represented on graphic displays (no typical depictions shall be used).

2. Displays of process equipment and piping shall be neatly laid out so as to be uncluttered and easily interpreted at a distance of 3 feet from the screen. Systems shall be displayed on multiple screens, where necessary, to allow all equipment and data to be shown clearly. When possible, displays of process piping and vessels shall be color coded to match the colors listed in the process piping schedules and shall match painting color schemes. This will allow the operators to easily identify, by color, what process is being viewed. If no color has been assigned to a certain process, the Contractor shall notify the Commissioner who shall assign one.
3. Because of the complexity of the process control system and the advanced capabilities of the System Software, extensive use of animation, color and appearance change and sound shall be employed.
4. Logon and password protection shall be required for all functions other than viewing general displays. The Commissioner shall decide the operator access level for each function the Contractor shall provide.

#### B. Display System Structure

1. Displays shall be generally organized into groups based on the process with which they are associated. An area index screen shall be provided showing "links" which when picked, will access all other screens in that system. There shall also be provided a general station-wide index screen, accessible from the area index screen, having links to access all other area index screens.
2. All displays throughout the station shall have certain common elements. These elements shall include but shall not be limited to the following.
  - a. There shall be a group of quick access "buttons" located at the top of each screen. Each of these buttons shall be assigned to a system screen and shall provide a link, which when picked, will display the assigned screen. When there are no alarms present on a given screen, the button shall be blank and disabled. When there is any unacknowledged alarm present on a screen, its assigned button shall flash the system name in amber. These screen names shall be assigned by the Commissioner. When the alarm(s) has (have) been acknowledged but is (are) still present, the system name shall show steady amber on the button. The relative position of these buttons shall not change from screen to screen within an area.

- b. There shall be additional buttons that the Contractor shall provide at the bottom of each screen allowing access to frequently needed items.
  - (1) The first items shall be an alarm SILENCE button and an ACKNOWLEDGE button. The SILENCE button shall silence alarms generated on any screen from any screen. This button shall silence both workstation audio alarms and any audible devices in the field and control room. The ACKNOWLEDGE button shall only acknowledge alarms generated on that screen. All alarms and alarms not associated with a given screen shall be acknowledged from the alarm history screen.
  - (2) The second item shall be an ALARM HISTORY button. This button shall immediately bring up the alarm history tabular display screen with the most recent alarms on the top of the list.
  - (3) The third common item shall be an INDEX button. This button shall immediately bring up on the display the area index screen previously described.
  - (4) The remaining bottom buttons shall be used to provide direct links to other screens associated with the current screen. Some of these associated screens will be defined later. When possible, buttons for links to a particular screen shall occupy the same relative position from screen to screen.
- C. Equipment Control Location Status: Each piece of process equipment controlled by the SCADA system shall have a field selector switch to transfer control of the equipment to the workstation level. The graphic representation for each unit shall have an adjacent text field indicating where the current control location is. The text background shall read "CONSOLE" on a blue background when control is at the workstation and read "DRIVE" or "FIELD" as appropriate on a gray background when control is elsewhere.
- D. Equipment Start/Stop Control
  - 1. All equipment started and stopped by the SCADA System shall have an operator graphic display on one or more of the graphic display screens. As shown or specified, each piece of equipment shall have a specific method of starting and stopping via the graphic display. Starting, stopping or changing operating mode of any equipment or system shall require double action followed by a confirming dialog box.
  - 2. The operator shall "double click" on a predefined pick box within the desired equipment symbol causing a dialog box to appear. The dialog box shall contain buttons for the different mode selections available to the operator for that piece of equipment or system. An "OK" button shall also appear in the

box which shall confirm the selection. Once completed, a second dialog box shall appear to reconfirm the selection with dialog such as "DO YOU WISH TO PLACE PUMP 3 IN RUN MODE?" The operator shall select a "YES" or "NO" button to confirm the selection. All dialog boxes shall have a "CANCEL" button which shall leave the system unchanged.

#### E. Alarms

1. Provide (8) levels of alarming for each analog variable. There shall be high-high-high, high-high, high, deviation high, deviation low, low, low-low, low-low-low.
2. Provide eight security levels. Annunciate alarm with horn provided in console(s) and display appropriate alarm. Assign alarm to alarm log.
  - a. The software shall display alarm status via color change or blink in line, text, or fill attributes.
  - b. The software shall have both alarm summary and alarm history displays with configurable message text including: DATE, TIME, TAGNAME, ALARM EVENT, ALARM TYPE, VALUE, SETPOINT, and SEVERITY.
  - c. The alarm summary and alarm history displays shall be configurable for color of alarm window, new alarms, acknowledge (ACK) alarms, and returned to normal (RTN) alarms.
  - d. Momentary alarms shall be reported by the software if the signal made a transition from the normal state to the alarm state and back to the normal state between the polling sequences of a remote unit.
  - e. Momentary normal states shall be reported by the software if the signal made a transition from the alarm state to the normal state and back to alarm state between the polling sequences of a remote unit.
  - f. Multiple alarm and multiple normal states shall be reported by the software if multiple transitions were made between polling sequences.
  - g. Alarms shall be able to be routed to screen, printer, and/or disk file.

#### F. Trending

1. Software shall allow the configuration of real-time trend displays which update continuously as new values are acquired.
2. Real-time trend display shall be in variable versus time format.

3. Real-time trend display shall support scaling of both variable and time axes.
4. Real-time trend display shall support 4 variables per graph.
5. Software shall allow any number of real-time trend graphs per screen.
6. Software shall allow configuration of real-time trends and historical trends on same screen.
7. Software shall allow configuration of trend graphs and other animation (bar-charts, push buttons, etc) on the same screen.
8. Real-time trend shall support trending result of arithmetic and/or logical expressions involving tag names by typing in the expression in the desired pen field.
9. The Supplier shall develop and assign real-time trends for all monitored system analog variables, and shall submit proposed trend plot groupings as part of the system software documentation submittal.

G. Historical Data Management:

1. The server shall contain a Historical Data Base Utility which provides for long term storage of data collected from remote processors or manually entered from the keyboard.
2. The historical data shall be collected from the real-time data base and from these samples; the historical system shall be configurable to calculate the average, maximum, minimum, standard deviation and total values over sampled data time intervals configurable on a per point basis.
3. The software shall allow for historical data to be manually entered from the keyboard to facilitate entry of other information to be used in generating historical plant performance calculations.
4. Signal values from the historical database shall be available for graphic displays, reports and trending.
5. The size of the historical database shall be limited only by available disk space.
6. The historical data management software shall provide utility routines to archive data to long-term storage devices on demand, or automatically based on a user configurable time schedule.
7. The historical database shall be organized as a series of Time Classes, each of which stores sampled or calculated values over a specified time interval. Up

to 63 time classes shall be configurable, and each time class shall accommodate over 13,000 values.

#### H. Reports

1. Software shall support printing of any screen created by the system integrator, whether or not it is the current active screen used by the operator.
2. Software shall allow screen prints based on demand (i.e. push button), event, time, or combination thereof.
3. Supplier shall submit actual copies of suggested report layouts for review and approval in accordance with the requirements of this Section.
4. The process report generation software shall provide the means to process, store, and print data for historical records.
5. Configuration shall be flexible so that contents of the reports can be easily modified.
6. As a minimum, the following data collection functions shall be provided for all analog variables:
  - a. Instantaneous value; value at the end of the data collection interval.
  - b. Average value over the time interval.
  - c. Totalization over the time interval.
  - d. Highest value over the time interval.
  - e. Lowest value over the time interval.
7. Equipment run times shall be monitored, calculated and reported for all major process equipment items in the system. Report data developed shall include year-to-date and month-to-date run times and starts for each item.
8. As a maximum, report data shall be collected and stored at ten-minute intervals.
9. Each log report page shall have the capability to contain information for ten log points as a minimum.
10. Periodic log reports shall be printed automatically at the end of the time period.
11. A calculation extension capability shall be provided to perform calculations on data that has been accumulated for report generation. Calculations shall consist of addition, subtraction, multiplication, and division functions for calculations of such items as engineering unit changes, totalization values

where measurement values are different, and performance indexes. Provisions shall be made for a minimum of 200 calculation extensions.

12. All reports shall be free form, thereby printing all general information, headings and data in an established format at the time of generation. Pre-printed sheets will not be acceptable. Each page of a report shall have printed the plant name, type of report, date and time the report was printed, and page numbers.
13. Software shall be provided for generation of special event, hourly, daily, monthly and annual reports. Reports shall be generated using process input/output, event information, analog, digital, manual and/or computed point information from records in database.

I. Process Variable Indicators and Controllers

1. Where indicated on the Contract Drawings, required by the specifications or wherever available, all analog data whether real or calculated shall be graphically displayed on the screen in its relative position in the process or in tabular form as required.
2. Workstation process indicators shall be provided with all of the following features.
3. Each indicator shall be displayed with the sending device's or instrument's tag number, which shall appear using the same format as the contract drawings.
4. Adjacent to the tag number, the current "real time" value of the variable, in engineering units, shall be displayed. Next to this shall appear the appropriate units. All analog values, whether real or calculated, shall have alarm points configured in the software. Those of a critical nature or where used to control equipment shall have this performed in the PLC while being set and monitored from the workstation. While within the normal range, the variable shall appear in black. When the variable moves outside the normal range, the text shall flash in red and the bubble shall flash amber. Once acknowledged, both will cease flashing and remain steady colors until the condition is corrected. A signal out of range or containing invalid data shall cause the text to display question marks on a flashing red background.
5. The operator shall be able to "double click" the tag number and cause a dialog box to appear. This box shall contain the full tag number of the instrument, measured variable name (i.e. Service Water Pump 1 Flow), calibrated range and current alarm points. One button shall be provided in the box to edit the alarm setpoints. A second button shall allow the operator to display a trend graph, on a partial screen, of the variable against a time base of minutes or hours (selectable).

- J. Accumulators: Provide HMI configuration for accumulations. Include run time for each piece of equipment. Include number of starts for each motor. Include totaled values for all flows.
- K. Security
  - 1. System protection from unauthorized access shall be provided by means of software interlocks.
  - 2. Software interlocks shall provide a minimum of four levels of security, system operator, supervisor, station superintendent and system engineer.
  - 3. Workstation mode software interlocks shall be provided to allow operators access to only the HMI software. Only system engineers shall be allowed to exit the software for access to the operating system and other resident software applications for PLC programming and editing. Program editing access shall require entry of a six-character entry code assigned within the controller program.
  - 4. All system users shall be required to log on to the WINDOWS software with a predefined user name and password. All defined user names and passwords shall be associated with a set security level.
  - 5. Each display shall be assigned a security level required to access it. All signals and control functions shall have separately assignable security levels.

### 3.04 GRAPHIC ELEMENTS

#### A. Display Screen Contents

- 1. Developers shall provide a hierarchal set of screens that include depictions of all of the equipment and systems covered by the Contract.
- 2. At the lowest level a single process system or subsystem shall be shown. At this level all mechanical equipment, pipelines and control devices in these lines that are a part of the normally operating process shall be shown, including all tanks; all mechanical equipment including pumps, heat exchangers, etc.; and all in-line valves (manual or automatic). Drain and overflow lines and manually operated sample valves and sample lines are optional and shall be shown only if space and clarity allow. Auxiliary lines such as flushing water lines not in use during normal process operation shall not be shown.
- 3. At succeeding higher levels a grouping of the levels below shall be shown. Little detail is required at these levels but a means of accessing the lower level screens is required.

4. At the highest level shall be two Station Overview screens which show the station as a whole. One screen shall provide a graphical representation of the plant site and the other shall provide an array of buttons labeled with all the various process areas of the plant. The graphical screen shall have hot zones that allow the operator to go to an area screen for a particular process area in the plant. The button type screen shall do the same by clicking on the button labeled with the process of interest.

B. Display Screen Resolution

1. Operator Workstations (OWS) and Area Control Stations (ACS): The process display screens shall have a resolution of 1024 pixels horizontal by 768 pixels vertical. Color resolution shall be 24-bit minimum (True Color).

C. Display Screen Background Color: All display screens shall use the default color.

D. Piping Representations

1. Process piping shall normally be shown as solid lines using a line width of 9pt. Thinner 5 pt lines shall be used for auxiliary service lines. Flow direction in pipelines should be shown by the use of arrows in the lines.
2. All process pipelines shall be shown in the colors that those lines are to be painted in the field. The colors follow Federal Standard 595B.
3. Where two different services are shown on the same screen having identical, or very similar, colors; one of the services shall use an alternative line display.
4. Each process screen shall contain a small legend block to help the operator clearly distinguish between the services. The legend shall contain the approved abbreviation of the service and an example of the graphical representation of the process service line. Area overview screens that show a large number of services in very small scale need not include the legend block.

E. Equipment and Valve Representations: The graphical representation of equipment and valves will use selections made by Operations from the HMI symbol library.

F. All equipment monitored or controlled by the SCADA System shall be shown in the following colors:

1. Green, if the equipment is stopped but ready to run
2. Red, if the equipment is running
3. Amber, if the equipment is in a malfunction alarm condition



4. Gray, if the equipment is not ready to run due to lack of power to the control circuits or prevented from running by an interlocking safety device. (Only if supported by installed hardware.).
- G. Coloring of Valves: All valves shown on the process screens shall be shown in the following colors:
1. Manually operated valves without position indication shall be shown in the same color of the pipeline in which they are installed.
  2. Manually operated valves with position indication shall change color depending on valve position, green if they are closed or red if they are open.
  3. Automatic valves shall be shown in green if they are closed or red if they are open. Also automatic valves shall be shown with a symbol for a valve operator (e.g. solenoid, motor, etc.). If an automatic valve has a malfunction alarm associated with the operator the operator shall be shown in amber if a malfunction occurs.
  4. Modulating valves shall be shown in green if they are fully closed or red if they are in any position other than fully closed. In addition, a small window positioned near the valve shall show the percent open of the valve.
- H. Equipment Names and Tag Numbers
1. The names for mechanical process equipment shall be shown beneath the piece of equipment in bold text and be underlined. The names should be in plain English. Valves and other controls shall not have names.
  2. Tag numbers for equipment and controls shall be hidden. The tag numbers shall be made visible if the equipment is in an alarm state or if the operator wants to see the tag by placing the mouse pointer over the tag. The tag shall be made visible by changing the point attribute based on either a change of alarm state, or a change of state caused by the "highlight" action.
- I. Mouse or Keyboard Actions: Any user action that involves the single click of a pointer device such as a mouse that causes an action to be carried out should happen on "mouse up" or "key up". An example would be screen navigation.
- J. Toolbars and Screen Navigation: Each full screen display shall have a toolbar at the top of the screen. The toolbar shall be the full width of the screen and be no more than 120 pt in height. The toolbar shall be identical for all screens for the project. The toolbar shall contain the following as a minimum.
1. Back: Pressing the Back button shall change the display to the previous screen in the queue.

2. Forward: Pressing the Forward button shall change the display to the next screen in the queue.
3. Alarms: Pressing the Alarms button shall change the display to the Alarm Summary screen. The button shall be configured to change the background from the default Text Button background color to flashing yellow whenever an unacknowledged alarm exists in the system.
4. Home or Station Overview: Pressing this button shall change the display to a screen that shows all of the process areas in the Station.
5. Security: Pressing the Security button shall cause the login screen to pop up. With the login screen shown a person can either log off the current user and/or sign in as a new user.
6. Trend: Pressing the Trend button shall open a selection screen listing all of the pre-configured historical trends available.
7. Report: Pressing the Report button shall open a selection screen listing all of the pre-configured reports available.
8. Print Screen: Pressing the Print Screen button shall print the current display screen.
9. Help: Pressing the help button shall open a pop-up screen with any help text screens related to the screen currently on display.

- K. Security Access Levels: There shall be four levels of security for the HMI application. An operator must log on to the system to change displays or take any control actions. Each operator shall be setup with a USER ID, a PASSWORD, and a Security Level. The Security Level assigned to each operator shall determine which items they can control. The control level assignments are described below.

Security Level	Description
Navigator	Allows screen navigation and monitoring.
Operator	Same as Navigator as well as Acknowledge alarms, start/stop motors, and open/close valves.
Supervisor	Same as Operator as well as change alarm high/low setpoints, change setpoints.
Administrator	Same as Supervisor as well as change interlocking alarm limits and tuning parameters. Also full access to user setup/modifications and ability to get to operating system.

- L. Trending: Trending shall be as defined in the Specifications.

M. Reports: All reports shall be generated and printed using black text and no background color. Reports shall be organized by equipment systems.

1. Daily Reports: Daily reports for any given day are to cover a day that is defined as the period of 6:00:01 AM of the given day to 6:00:00 AM of the following day. Each of the 24 hourly readings starting at 7:00 AM and ending at 6:00 AM is to represent the hourly period ending at the time shown. For example the data on the line for 10:00 AM would include all the data from 9:00:01 AM through 10:00:00 AM.
2. Monthly Reports: Monthly reports are to include the data of 28 to 31 Days depending upon the month. For months of less than 31 days, any unused lines in the report form are not to be included in any process calculations.

N. Alarms and Events

1. Alarm Priority Levels: There should be at least four alarm priority levels:
  - a. High priority level alarms shall indicate the malfunction or failure of either a critical piece of process equipment or a failure or malfunction of a SCADA system. High priority alarms are to be displayed on the Alarm Summary screen and logged in the alarm historian.
  - b. Medium priority level alarms shall indicate the malfunction or failure of a non-critical piece of process equipment. Non-critical equipment is defined as equipment that does not have an immediate impact on the process. An example would be where there is an automatic replacement of the failed equipment with a lag or standby unit. Medium priority level alarms are to be displayed on the Alarm Summary screen and logged in the alarm historian.
  - c. Low priority (warning) level alarms shall indicate an impending problem that should be monitored by the operator. Low priority level alarms are to be displayed on the Alarm Summary screen and logged in the alarm historian.
  - d. Events that are not process related. Events shall include the starting or stopping of a piece of equipment, the logon or logoff of an operator or the change of a monitoring system parameter such as a setpoint or tuning parameter. Events are not to be displayed on the Alarm Summary screen but are to be logged by the alarm or event historian.
2. Alarm States: Each alarm shall have four states:
  - a. Normal, or not in an alarm condition. The normal state is neither displayed nor logged.

- b. Active but not acknowledged. The change of alarm state from normal to active is logged. An active but not acknowledged alarm is displayed on the Alarm Summary screen.
  - c. Active and acknowledged. The changes of alarm state from active but not acknowledged to active and acknowledged are logged. An active and acknowledged alarm is displayed on the Alarm Summary screen.
  - d. Return to normal. The return to normal condition is logged and causes a change in the display of the alarm on the Alarm Summary screen.
3. Alarm Display Colors
- a. High Priority Alarms
    - (1) A high priority alarm that is active but not acknowledged shall be displayed on the Alarm Summary screen with black text on a flashing yellow background. The flash rate shall be once per second.
    - (2) A high priority alarm that is active and acknowledged shall be displayed on the Alarm Summary screen with black text on a steady yellow background.
    - (3) A high priority alarm that has returned to normal but is not acknowledged shall be displayed on the Alarm Summary screen as black text on a flashing lime background. The flash rate shall be once per two seconds.
  - b. Medium Priority Alarms
    - (1) A medium priority alarm that is active but not acknowledged shall be displayed on the Alarm Summary screen with black text on a flashing orange background. The flash rate shall be once per two seconds.
    - (2) A medium priority alarm that is active and acknowledged shall be displayed on the Alarm Summary screen with black text on a steady orange background.
    - (3) A medium priority alarm that has returned to normal but is not acknowledged shall be displayed on the Alarm Summary screen as black text on a flashing lime background. The flash rate shall be once per two seconds.

c. Low Priority Alarms

- (1) A low priority alarm that is active but not acknowledged shall be displayed on the Alarm Summary screen with black text on a flashing aqua background. The flash rate shall be once per second.
- (2) A low priority alarm that is active and acknowledged shall be displayed on the Alarm Summary screen with black text on a steady aqua background.
- (3) A low priority alarm that has returned to normal but is not acknowledged shall be displayed on the Alarm Summary screen as black text on a steady white background.

- d. All Alarms: Once an alarm has both been acknowledged and has returned to normal it shall be removed from the Alarm Summary screen.

-END OF SECTION-

**Section 17280**  
**SCADA SYSTEM - INPUT/OUTPUT POINT LIST**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This Section describes the input/output (I/O) point list, which follows this Section and requirements for configuring the control system database.
- B. The I/O list information is available from the Commissioner on diskette. Allow 30 days from request to deliver this diskette.

**1.02 RELATED SPECIFICATION**

- A. Section 17212 - Programmable Logic Controllers

**1.03 SUBMITTALS**

- A. For each I/O attribute listed in the I/O list that cannot be used exactly as listed, submit an explanation of the reason for the deviation and propose a method to modify the I/O list information. Do not proceed with any configuration until a method of resolving deviations is approved.
- B. Include the control system I/O database information in the PLC specific submittals for Section 17212.

**1.04 I/O POINT LIST DESCRIPTION**

- A. The I/O point list contains the information necessary to configure the PLC I/O interface hardware and to indicate range conversion or signal functions.
  - 1. I/O Location: Termination point for interface to SCADA equipment.
  - 2. Signal Tag: An alphanumeric character string that uniquely identifies the signal.
  - 3. Signal Description/Location: An alphanumeric character string that describes the signal purpose.
  - 4. Signal Type: One of the following:
    - a. AI designates an analog input.
    - b. DI designates a discrete input.
    - c. DO designates a momentary, maintained or latched discrete output.
    - d. Ethernet designates an Ethernet data connection.
    - e. Modbus designates a Modbus data connection.

5. Input From / Output To: Indicates the signal origin for PLC inputs or the signal destinations for PLC outputs.
6. Remarks: Indicate the location, drawing number, and any additional information.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 I/O CONFIGURATION

- A. Implement the control system database fields in a consistent manner by using the following procedures:
  1. Use abbreviations and acronyms already established in the Contract Documents, and, in particular, use the information in the I/O list.
  2. Use only one abbreviation or acronym for a word or group of words respectively.
  3. Use the same subject and word order within data fields.
  4. Use the same term (phrase, word or acronym) to denote the same meaning. Do not use multiple terms for a single meaning.
  5. Use the point names, descriptions, logic state descriptions, ranges and units of measurement exactly the same wherever the point is referenced.
  6. Show point names and descriptions for all point references on documentation.
  7. Spell correctly.
  8. Maintain lists of acronyms and abbreviations used.

### 3.02 I/O HARDWARE CONFIGURATION

- A. Partition the I/O among cards within an I/O enclosure to provide control loop integrity.
  1. Put all inputs of the same I/O type associated with a device (e.g. fan) on the same card.
  2. Put all inputs of the same I/O type for devices arranged in process trains (e.g. a pump, its inlet valve and its outlet valve) on the same card or cards if more than one card is needed to accommodate the points.

3. Put all outputs of the same I/O type associated with a device or group of devices in a process train on the same card.
4. Where the preceding requirements specified in this subparagraph would cause more than 20 percent spare points on a card, points for a device or process train may be split between two consecutive cards.
5. Make unused terminals resulting from partitioning the I/O into pre-wired spares. Provide pre-wired spare points with all cabling and termination internal to the enclosure as done for other I/O points.

### 3.03 SPARES UTILIZATION

- A. If I/O is added by change order, incorporate pre-wired spare points into the active point database at no increase in Contract price.
  1. Include changing point names, descriptions, ranges, or statuses from spare to the new point.
  2. Include adding points to group displays and summary displays.
  3. Include related documentation changes.
- B. Spares utilization will be subject to the following limitations:
  1. The incorporation will not alter the control software configuration except to make the point accessible to displays, reports and future control software configuration.
  2. The incorporation will not alter the local area panels or field wiring to the device.
  3. Additions will not increase the size of reports or number of displays beyond that specified.
  4. The change will not be made subsequent to the shop drawing approval for a given process area.
- C. Treat changing of active points to spare points in the same manner as incorporation of spares.

### 3.04 POINT DATA FIELDS

- A. I/O point data fields will be subject to review and modification by the Commissioner during the shop drawing review phase. Incorporate changes directed by the Commissioner completely into the entire system at no increase in Contract price subject to the following limitations:



1. Limit the total number of modifications to 20 percent of the total number of I/O points.
2. Each unique change will count as one modification. For example, modifying the description, range, and engineering unit on an analog input count as 3 modifications.
3. Analog input alarm limit definition will not be counted as a modification.

3.05 INPUT/OUTPUT SCHEDULE (Starts on Next Page)

**Section 17280**  
**SCADA SYSTEM - INPUT/OUTPUT LIST**

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-Firm's Off.	Ethernet	FM01a01Y	Dust Suppression System DSS-01	DSS-01	Dwg. M-514
F-Ops. Rm.	Ethernet	FA01a01Y	Shuttle Bay Doors OHD-05 to -08	OHD-5,6,7,8	Dwg. M-510 / via CTS
F-Ops. Rm.	Ethernet	FM18a01Y	Container Transport Systems	CTS-1,2,3,4	Dwg. M-517
F-PLC-01	DI	FA02a01C	Loading Level Truck Door OHD-3 Closed	OHD-3	Dwg. M-514
F-PLC-01	DI	FA02a01F	Loading Level Truck Door OHD-3 Failure	OHD-3	Dwg. M-514
F-PLC-01	DI	FA02a01O	Loading Level Truck Door OHD-3 Open	OHD-3	Dwg. M-514
F-PLC-01	DI	FE01a02C	Incoming Breaker 1 Closed	LSG-01	Dwg. M-516
F-PLC-01	DI	FE01a02T	Incoming Breaker 1 Tripped	LSG-01	Dwg. M-516
F-PLC-01	DI	FE01a03C	Incoming Breaker 2 Closed	LSG-01	Dwg. M-516
F-PLC-01	DI	FE01a03T	Incoming Breaker 2 Tripped	LSG-01	Dwg. M-516
F-PLC-01	DI	FE01a04C	Tie Breaker Closed	LSG-01	Dwg. M-516
F-PLC-01	DI	FE01a05C	Generator Breaker Closed	LSG-01	Dwg. M-516
F-PLC-01	DI	FE02a01F	Emergency Generator Failure	GEN-01	Dwg. M-516
F-PLC-01	DI	FE02a01Y	Emergency Generator Running	GEN-01	Dwg. M-516
F-PLC-01	DI	FE02a02F	Emergency Generator Fuel Recirc. System Trouble	GFR-01	Dwg. M-516
F-PLC-01	DI	FE04a01F	CCTV System Trouble	Security Sys. Server	Dwg. M-516
F-PLC-01	DI	FE05a01A	Access Control System Intrusion Alarm	Security Rm	Dwg. M-516
F-PLC-01	DI	FE05a01F	Access Control System Trouble	Security Rm	Dwg. M-516
F-PLC-01	DI	FE06a01A	Fire Alarm Control Panel Fire Alarm	FACP	Dwg. M-516
F-PLC-01	DI	FE06a01D	Fire Alarm Control Panel Tamper Switch Activated	FACP	Dwg. M-516
F-PLC-01	DI	FE06a01F	Fire Alarm Control Panel Fire Flow	FACP	Dwg. M-516
F-PLC-01	DI	FE06a01W	Fire Alarm Control Panel Dry System Trouble	FACP	Dwg. M-516
F-PLC-01	DI	FE08a01F	Network Protectors High Temperature	Transformer Facility	Dwg. M-516
F-PLC-01	DI	FH06a01F	Personnel Area ACU-1 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a02F	Personnel Area ACU-2 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a03F	Personnel Area ACU-3 Trouble	TCP-01	Dwg. M-514

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-01	DI	FH06a04F	Personnel Area ACU-4 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a05F	Personnel Area ACU-5 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a11F	Personnel Area RTU-2 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a21F	Personnel Area HPU-1 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH06a22F	Personnel Area HPU-2 Trouble	TCP-01	Dwg. M-514
F-PLC-01	DI	FH10a01F	HVAC Heat Tracing System HTS-03 Fault	HTS-03	Dwg. M-514
F-PLC-01	DI	FH12a01F	Draft Induction Fan DIF-01 Failure	TCP-01	Dwg. M-514
F-PLC-01	DI	FH12a02F	Draft Induction Fan DIF-02 Failure	TCP-01	Dwg. M-514
F-PLC-01	DI	FM03a01F	Odor Control System OCS-01 Pump 1 Failure	OCS-01	Dwg. M-514
F-PLC-01	DI	FM03a01Y	Odor Control System OCS-01 Pump 1 Running	OCS-01	Dwg. M-514
F-PLC-01	DI	FM03a02F	Odor Control System OCS-01 Pump 2 Failure	OCS-01	Dwg. M-514
F-PLC-01	DI	FM03a02Y	Odor Control System OCS-01 Pump 2 Running	OCS-01	Dwg. M-514
F-PLC-01	DI	FM03a03F	Odor Control System OCS-01 Fault	OCS-01	Dwg. M-514
F-PLC-01	DI	FM03a06L	Odor Control System OCS-01 Low Chemical Level	OCS-01	Dwg. M-514
F-PLC-01	DI	FM07a01F	Constant Tension Winch CTW-1 Fault	CTW-01	Dwg. M-511
F-PLC-01	DI	FM07a02F	Constant Tension Winch CTW-2 Fault	CTW-02	Dwg. M-511
F-PLC-01	DI	FM12a01F	Mechanical Heat Tracing System HTS-01 Fault	HTS-01	Dwg. M-514
F-PLC-01	DI	FM19a01F	Motor Oil Storage Tank Trouble	FMS-01	Dwg. M-515
F-PLC-01	DI	FM19a02F	Waste Oil Storage Tank Trouble	FMS-01	Dwg. M-515
F-PLC-01	DI	FM19a03F	Hydraulic Fluid Storage Tank Trouble	FMS-01	Dwg. M-515
F-PLC-01	DI	FM20a01F	Service Water System SWS-01 Pump 1 Failure	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a01Y	Service Water System SWS-01 Pump 1 Running	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a02F	Service Water System SWS-01 Pump 2 Failure	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a02Y	Service Water System SWS-01 Pump 2 Running	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a03F	Service Water System SWS-01 Pump 3 Failure	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a03Y	Service Water System SWS-01 Pump 3 Running	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a04P	Service Water System SWS-01 Low Suction Pressure	SWS-01	Dwg. M-514
F-PLC-01	DI	FM20a05P	Service Water System SWS-01 High Disch. Pressure	SWS-01	Dwg. M-514
F-PLC-01	DI	FM21a01F	Fuel Alarm Panel - Trouble		Dwg. M-515

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-01	DI	FP02a01F	Oil/Water Separator OWS-01 Trouble	OWS-01	Dwg. M-515
F-PLC-01	DI	FP04a01F	Potable Water Booster Pump System DWP-01 Trouble	DWP-01	Dwg. M-515
F-PLC-01	DI	FP06a01L	Interstitial Space Leak Detected	Float Sw.	Dwg. M-515
F-PLC-01	DI	FP08a01Y	Fire Pump Running	FRP-01	Dwg. M-515
F-PLC-01	DI	FP08a02A	Fire Pump Controller Connected to Alternate Source	FPCP	Dwg. M-515
F-PLC-01	DI	FP08a02F	Fire Pump Controller Loss of Phase	FPCP	Dwg. M-515
F-PLC-01	DI	FP08a02O	Fire Pump Controller Emerg. Power Iso. Switch Open	FPCP	Dwg. M-515
F-PLC-01	DI	FP08a02R	Fire Pump Controller Phase Reversal	FPCP	Dwg. M-515
F-PLC-01	DI	FP08a03E	ATS-02 Power Source Emergency Power	ATS-02	Dwg. M-515
F-PLC-01	DI	FP08a04F	Fire Pump System Trouble	FRCP	Dwg. M-515
F-PLC-01	DI	FP08a04P	Fire Pump System Low Pressure	FRCP	Dwg. M-515
F-PLC-01	DI	FP08a05P	Jockey Pump Low Pressure	FPCP	Dwg. M-515
F-PLC-01	DI	FP09a01F	Emergency Shower/Eyewash SEW-01 Flow	SEW-01	Dwg. M-515
F-PLC-01	DI	FP09a02F	Emergency Shower/Eyewash SEW-02 Flow	SEW-02	Dwg. M-515
F-PLC-01	DI	FP09a03F	Emergency Shower/Eyewash SEW-03 Flow	SEW-03	Dwg. M-515
F-PLC-01	DI	FP09a04F	Emergency Shower/Eyewash SEW-04 Flow	SEW-04	Dwg. M-515
F-PLC-01	DI	FP10a01F	Plumbing Heat Tracing System HTS-02 Fault	HTS-02	Dwg. M-514
F-PLC-01	DO	FA08a01O	Main Entrance Vehicle Gate HSG-01 Open Command	HSG-01	Dwg. M-516
F-PLC-02	AI	FH03a01T	Space Temperature 1	Mezzanine	Dwg. M-511
F-PLC-02	AI	FH03a02T	Space Temperature 2	Mezzanine	Dwg. M-511
F-PLC-02	AI	FH03a03T	Space Temperature 3	Mezzanine	Dwg. M-511
F-PLC-02	DI	FA05a01C	Tipping Level Inbound Truck Door OHD-1 Closed	OHD-1	Dwg. M-514
F-PLC-02	DI	FA05a01F	Tipping Level Inbound Truck Door OHD-1 Failure	OHD-1	Dwg. M-514
F-PLC-02	DI	FA05a01O	Tipping Level Inbound Truck Door OHD-1 Open	OHD-1	Dwg. M-514
F-PLC-02	DI	FA06a01C	Tipping Level Outbound Truck Door OHD-2 Closed	OHD-2	Dwg. M-514
F-PLC-02	DI	FA06a01F	Tipping Level Outbound Truck Door OHD-2 Failure	OHD-2	Dwg. M-514
F-PLC-02	DI	FA06a01O	Tipping Level Outbound Truck Door OHD-2 Open	OHD-2	Dwg. M-514
F-PLC-02	DI	FH01a01F	Supply Air Fan SAF-01 Failure	SAF-01	Dwg. M-511
F-PLC-02	DI	FH01a01M	Supply Air Fan SAF-01 Auto Mode	SAF-01	Dwg. M-511

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-02	DI	FH01a01Y1	Supply Air Fan SAF-01 Motor Running	SAF-01	Dwg. M-511
F-PLC-02	DI	FH01a01Y2	Supply Air Fan SAF-01 Fan Running	SAF-01	Dwg. M-511
F-PLC-02	DI	FH01a02F	Supply Air Fan SAF-02 Failure	SAF-02	Dwg. M-511
F-PLC-02	DI	FH01a02M	Supply Air Fan SAF-02 Auto Mode	SAF-02	Dwg. M-511
F-PLC-02	DI	FH01a02Y1	Supply Air Fan SAF-02 Motor Running	SAF-02	Dwg. M-511
F-PLC-02	DI	FH01a02Y2	Supply Air Fan SAF-02 Fan Running	SAF-02	Dwg. M-511
F-PLC-02	DI	FH01a03F	Supply Air Fan SAF-03 Failure	SAF-03	Dwg. M-511
F-PLC-02	DI	FH01a03M	Supply Air Fan SAF-03 Auto Mode	SAF-03	Dwg. M-511
F-PLC-02	DI	FH01a03Y1	Supply Air Fan SAF-03 Motor Running	SAF-03	Dwg. M-511
F-PLC-02	DI	FH01a03Y2	Supply Air Fan SAF-03 Fan Running	SAF-03	Dwg. M-511
F-PLC-02	DI	FH01a04F	Supply Air Fan SAF-04 Failure	SAF-04	Dwg. M-511
F-PLC-02	DI	FH01a04M	Supply Air Fan SAF-04 Auto Mode	SAF-04	Dwg. M-511
F-PLC-02	DI	FH01a04Y1	Supply Air Fan SAF-04 Motor Running	SAF-04	Dwg. M-511
F-PLC-02	DI	FH01a04Y2	Supply Air Fan SAF-04 Fan Running	SAF-04	Dwg. M-511
F-PLC-02	DI	FH01a05F	Supply Air Fan SAF-05 Failure	SAF-05	Dwg. M-511
F-PLC-02	DI	FH01a05M	Supply Air Fan SAF-05 Auto Mode	SAF-05	Dwg. M-511
F-PLC-02	DI	FH01a05Y1	Supply Air Fan SAF-05 Motor Running	SAF-05	Dwg. M-511
F-PLC-02	DI	FH01a05Y2	Supply Air Fan SAF-05 Fan Running	SAF-05	Dwg. M-511
F-PLC-02	DI	FH01a06F	Supply Air Fan SAF-06 Failure	SAF-06	Dwg. M-511
F-PLC-02	DI	FH01a06M	Supply Air Fan SAF-06 Auto Mode	SAF-06	Dwg. M-511
F-PLC-02	DI	FH01a06Y1	Supply Air Fan SAF-06 Motor Running	SAF-06	Dwg. M-511
F-PLC-02	DI	FH01a06Y2	Supply Air Fan SAF-06 Fan Running	SAF-06	Dwg. M-511
F-PLC-02	DI	FH01a07F	Supply Air Fan SAF-07 Failure	SAF-07	Dwg. M-511
F-PLC-02	DI	FH01a07M	Supply Air Fan SAF-07 Auto Mode	SAF-07	Dwg. M-511
F-PLC-02	DI	FH01a07Y1	Supply Air Fan SAF-07 Motor Running	SAF-07	Dwg. M-511
F-PLC-02	DI	FH01a07Y2	Supply Air Fan SAF-07 Fan Running	SAF-07	Dwg. M-511
F-PLC-02	DI	FH02a01F	Exhaust Air Fan EAF-01 Failure	EAF-01	Dwg. M-511
F-PLC-02	DI	FH02a01M	Exhaust Air Fan EAF-01 Auto Mode	EAF-01	Dwg. M-511
F-PLC-02	DI	FH02a01Y1	Exhaust Air Fan EAF-01 Motor Running	EAF-01	Dwg. M-511

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-02	DI	FH02a01Y2	Exhaust Air Fan EAF-01 Fan Running	EAF-01	Dwg. M-511
F-PLC-02	DI	FH02a02F	Exhaust Air Fan EAF-02 Failure	EAF-02	Dwg. M-511
F-PLC-02	DI	FH02a02M	Exhaust Air Fan EAF-02 Auto Mode	EAF-02	Dwg. M-511
F-PLC-02	DI	FH02a02Y1	Exhaust Air Fan EAF-02 Motor Running	EAF-02	Dwg. M-511
F-PLC-02	DI	FH02a02Y2	Exhaust Air Fan EAF-02 Fan Running	EAF-02	Dwg. M-511
F-PLC-02	DI	FH02a03F	Exhaust Air Fan EAF-03 Failure	EAF-03	Dwg. M-511
F-PLC-02	DI	FH02a03M	Exhaust Air Fan EAF-03 Auto Mode	EAF-03	Dwg. M-511
F-PLC-02	DI	FH02a03Y1	Exhaust Air Fan EAF-03 Motor Running	EAF-03	Dwg. M-511
F-PLC-02	DI	FH02a03Y2	Exhaust Air Fan EAF-03 Fan Running	EAF-03	Dwg. M-511
F-PLC-02	DI	FH02a04F	Exhaust Air Fan EAF-04 Failure	EAF-04	Dwg. M-511
F-PLC-02	DI	FH02a04M	Exhaust Air Fan EAF-04 Auto Mode	EAF-04	Dwg. M-511
F-PLC-02	DI	FH02a04Y1	Exhaust Air Fan EAF-04 Motor Running	EAF-04	Dwg. M-511
F-PLC-02	DI	FH02a04Y2	Exhaust Air Fan EAF-04 Fan Running	EAF-04	Dwg. M-511
F-PLC-02	DI	FH02a05F	Exhaust Air Fan EAF-05 Failure	EAF-05	Dwg. M-511
F-PLC-02	DI	FH02a05M	Exhaust Air Fan EAF-05 Auto Mode	EAF-05	Dwg. M-511
F-PLC-02	DI	FH02a05Y1	Exhaust Air Fan EAF-05 Motor Running	EAF-05	Dwg. M-511
F-PLC-02	DI	FH02a05Y2	Exhaust Air Fan EAF-05 Fan Running	EAF-05	Dwg. M-511
F-PLC-02	DI	FH02a06F	Exhaust Air Fan EAF-06 Failure	EAF-06	Dwg. M-511
F-PLC-02	DI	FH02a06M	Exhaust Air Fan EAF-06 Auto Mode	EAF-06	Dwg. M-511
F-PLC-02	DI	FH02a06Y1	Exhaust Air Fan EAF-06 Motor Running	EAF-06	Dwg. M-511
F-PLC-02	DI	FH02a06Y2	Exhaust Air Fan EAF-06 Fan Running	EAF-06	Dwg. M-511
F-PLC-02	DI	FH02a07F	Exhaust Air Fan EAF-07 Failure	EAF-07	Dwg. M-511
F-PLC-02	DI	FH02a07M	Exhaust Air Fan EAF-07 Auto Mode	EAF-07	Dwg. M-511
F-PLC-02	DI	FH02a07Y1	Exhaust Air Fan EAF-07 Motor Running	EAF-07	Dwg. M-511
F-PLC-02	DI	FH02a07Y2	Exhaust Air Fan EAF-07 Fan Running	EAF-07	Dwg. M-511
F-PLC-02	DI	FH04a01FH	Supply Air Fan SAF-08 Failure High Speed	SAF-08	Dwg. M-511
F-PLC-02	DI	FH04a01FL	Supply Air Fan SAF-08 Failure Low Speed	SAF-08	Dwg. M-511
F-PLC-02	DI	FH04a01M	Supply Air Fan SAF-08 Auto Mode	SAF-08	Dwg. M-511
F-PLC-02	DI	FH04a01Y1	Supply Air Fan SAF-08 Motor Running High Speed	SAF-08	Dwg. M-511

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-02	DI	FH04a01Y1	Supply Air Fan SAF-08 Motor Running Low Speed	SAF-08	Dwg. M-511
F-PLC-02	DI	FH04a01Y2	Supply Air Fan SAF-08 Fan Running High Speed	SAF-08	Dwg. M-511
F-PLC-02	DI	FH04a01Y2	Supply Air Fan SAF-08 Fan Running Low Speed	SAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01FH	Exhaust Air Fan EAF-08 Failure High Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01FL	Exhaust Air Fan EAF-08 Failure Low Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01M	Exhaust Air Fan EAF-08 Auto Mode	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01Y1	Exhaust Air Fan EAF-08 Motor Running High Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01Y1	Exhaust Air Fan EAF-08 Motor Running Low Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01Y2	Exhaust Air Fan EAF-08 Fan Running High Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH05a01Y2	Exhaust Air Fan EAF-08 Fan Running Low Speed	EAF-08	Dwg. M-511
F-PLC-02	DI	FH08a01H	Gas Monitoring Panel NOx Gas Detection Alarm	GMP-01	Dwg. M-514
F-PLC-02	DI	FH08a01W	Gas Monitoring Panel NOx Gas Detection Warning	GMP-01	Dwg. M-514
F-PLC-02	DI	FH08a02A	Gas Monitoring Panel CO Gas Detection Alarm	GMP-01	Dwg. M-514
F-PLC-02	DI	FH08a02W	Gas Monitoring Panel CO Gas Detection Warning	GMP-01	Dwg. M-514
F-PLC-02	DI	FH08a03F	Gas Monitoring Panel Trouble	GMP-01	Dwg. M-514
F-PLC-02	DI	FH09a01F	Exhaust Air Fan EAF-14 Failure	EAF-14	Dwg. M-511
F-PLC-02	DI	FH09a01M	Exhaust Air Fan EAF-14 Auto Mode	EAF-14	Dwg. M-511
F-PLC-02	DI	FH09a01Y1	Exhaust Air Fan EAF-14 Motor Running	EAF-14	Dwg. M-511
F-PLC-02	DI	FH09a01Y2	Exhaust Air Fan EAF-14 Fan Running	EAF-14	Dwg. M-511
F-PLC-02	DO	FH01a01N	Supply Air Fan SAF-01 Run Command	SAF-01	Dwg. M-511
F-PLC-02	DO	FH01a02N	Supply Air Fan SAF-02 Run Command	SAF-02	Dwg. M-511
F-PLC-02	DO	FH01a03N	Supply Air Fan SAF-03 Run Command	SAF-03	Dwg. M-511
F-PLC-02	DO	FH01a04N	Supply Air Fan SAF-04 Run Command	SAF-04	Dwg. M-511
F-PLC-02	DO	FH01a05N	Supply Air Fan SAF-05 Run Command	SAF-05	Dwg. M-511
F-PLC-02	DO	FH01a06N	Supply Air Fan SAF-06 Run Command	SAF-06	Dwg. M-511
F-PLC-02	DO	FH01a07N	Supply Air Fan SAF-07 Run Command	SAF-07	Dwg. M-511
F-PLC-02	DO	FH02a01N	Exhaust Air Fan EAF-01 Run Command	EAF-01	Dwg. M-511
F-PLC-02	DO	FH02a02N	Exhaust Air Fan EAF-02 Run Command	EAF-02	Dwg. M-511
F-PLC-02	DO	FH02a03N	Exhaust Air Fan EAF-03 Run Command	EAF-03	Dwg. M-511

I/O Location	Signal Type	Signal Tag	Signal Description/Location	Input From/Output To	Remarks/Drawing No.
F-PLC-02	DO	FH02a04N	Exhaust Air Fan EAF-04 Run Command	EAF-04	Dwg. M-511
F-PLC-02	DO	FH02a05N	Exhaust Air Fan EAF-05 Run Command	EAF-05	Dwg. M-511
F-PLC-02	DO	FH02a06N	Exhaust Air Fan EAF-06 Run Command	EAF-06	Dwg. M-511
F-PLC-02	DO	FH02a07N	Exhaust Air Fan EAF-07 Run Command	EAF-07	Dwg. M-511
F-PLC-02	DO	FH04a01NH	Supply Air Fan SAF-08 Run High Speed Command	SAF-08	Dwg. M-511
F-PLC-02	DO	FH04a01NL	Supply Air Fan SAF-08 Run Low Speed Command	SAF-08	Dwg. M-511
F-PLC-02	DO	FH05a01NH	Exhaust Air Fan EAF-08 Run High Speed Command	EAF-08	Dwg. M-511
F-PLC-02	DO	FH05a01NL	Exhaust Air Fan EAF-08 Run Low Speed Command	EAF-08	Dwg. M-511
F-PLC-02	DO	FH09a01N	Exhaust Air Fan EAF-14 Run Command	EAF-14	Dwg. M-511
F-PLC-02	DO	FM17a01C	Tipping Bay 1 TSS-09 Closed Light On Command	TSS-09	Dwg. M-511
F-PLC-02	DO	FM17a01O	Tipping Bay 1 TSS-09 Open Light On Command	TSS-09	Dwg. M-511
F-PLC-02	DO	FM17a02C	Tipping Bay 2 TSS-10 Closed Light On Command	TSS-10	Dwg. M-511
F-PLC-02	DO	FM17a02O	Tipping Bay 2 TSS-10 Open Light On Command	TSS-10	Dwg. M-511
F-PLC-02	DO	FM17a03C	Tipping Bay 3 TSS-11 Closed Light On Command	TSS-11	Dwg. M-511
F-PLC-02	DO	FM17a03O	Tipping Bay 3 TSS-11 Open Light On Command	TSS-11	Dwg. M-511
F-PLC-02	DO	FM17a04C	Tipping Bay 4 TSS-12 Closed Light On Command	TSS-12	Dwg. M-511
F-PLC-02	DO	FM17a04O	Tipping Bay 4 TSS-12 Open Light On Command	TSS-12	Dwg. M-511
F-PLC-02	DO	FM17a05C	Tipping Bay 5 TSS-13 Closed Light On Command	TSS-13	Dwg. M-511
F-PLC-02	DO	FM17a05O	Tipping Bay 5 TSS-13 Open Light On Command	TSS-13	Dwg. M-511
F-PLC-02	DO	FM17a06C	Tipping Bay 6 TSS-14 Closed Light On Command	TSS-14	Dwg. M-511
F-PLC-02	DO	FM17a06O	Tipping Bay 6 TSS-14 Open Light On Command	TSS-14	Dwg. M-511



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**Section 17320**  
**SCADA SYSTEM - CONTROL PANELS AND ENCLOSURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, start-up and place into satisfactory operation all control panels and/or enclosures.

**1.02 RELATED SPECIFICATIONS**

- A. Section 02317 - Backfilling
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 05120 - Structural Steel
- D. Section 17101 - SCADA System - General Requirements
- E. Section 17330 - SCADA System - Panel Instruments and Devices
- F. Section 17600 - SCADA System - Control Strategies

**1.03 QUALITY ASSURANCE****A. Standards, Codes and Regulations**

- 1. Construction of panels and the installation and interconnection of all equipment and devices mounted within shall comply with applicable provisions of the following standards, codes and regulations:
  - a. JIC - Joint Industrial Council Standards
  - b. NEC - National Electrical Code
  - c. NEMA - National Electrical Manufacturer's Association Standards
  - d. ASTM - American Society for Testing and Materials
  - e. OSHA - Operational Safety and Health Administration Regulations
  - f. State and Local code requirements.
  - g. Where any conflict arises between codes or standards, the more stringent requirement shall apply.

- 2. All materials and equipment shall be new and all panels shall be built in an Underwriters Laboratory (UL), Inc., approved panel shop and bear the UL label.

**B. General Design Requirements**

- 1. The Contractor shall comply with the requirements of Section 17101 - SCADA System - General Requirements.

2. The Contractor shall comply with the control description of Section 17600 - SCADA System - Control Strategies.
- C. Factory Assembly and Testing: The Contractor shall comply with the requirements of Section 17101 - SCADA System - General Requirements.

#### 1.04 SUBMITTALS

- A. Comply with the requirements of Section 17101 - SCADA System - General Requirements.

### PART 2 PRODUCTS

#### 2.01 GENERAL CONSTRUCTION REQUIREMENTS

- A. The Contractor shall provide all electrical and/or pneumatic components and devices, support hardware, fasteners, interconnecting wiring and/or piping required to make the control panels and/or enclosures complete and operational.
- B. The Contractor shall locate and install all devices and components so that connections can be easily made and that there is ample room for servicing each item.
- C. Components for installation on panel exterior shall be located generally as shown. Layouts shall be submitted for approval as per Section 17101 - SCADA System - General Requirements.
- D. Where permitted by location and layout as shown, panels and enclosures shall have full height rear access doors. Where rear doors are not possible, panels shall have full height front access doors.
- E. The Contractor shall adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.
- F. The Contractor shall provide sub-panels for installation of all relays and other internally mounted components.
- G. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips, unless otherwise specified.
- H. The Contractor shall provide copper grounding studs for all panel equipment.
- I. The Contractor shall provide the following convenience accessories inside of each full height control panel:
  1. One 120 Vac, 20A duplex, grounding type receptacle.

2. One 120 Vac fluorescent light fixture with 40 Watt lamp and protective shatter resistant plastic shield
  3. One 120 Vac, 20A, snap switch, to turn on the light, mounted in an outlet box with a cover and located so that it is easily accessible from access door.
  4. Service light with switch and duplex receptacle shall have its own circuit breaker and separate power feed.
- J. The bottom 12 inches of free standing panels shall be free of all devices, including terminal strips, to provide ease of installation and testing.
- K. No device shall be mounted less than 36 inches above the operating floor level, unless otherwise specified.

## 2.02 IDENTIFICATION

- A. The Contractor shall provide laminated plastic nameplates for identification of panels and components mounted thereon as follows:
1. Nameplates shall be of 3/32-inch thick laminated phenolic type with white matte finish surface and black letter engraving.
  2. Panel identification nameplates to have 1/2-inch high letter engravings.
  3. Panel-mounted component (i.e., control devices, indicating lights, selector switches, etc.) identification nameplates to have 1/4-inch high letter engravings.
  4. Nameplates shall be attached to the panel face with two stainless steel self-tapping screws, unless the NEMA rating of the panel would be compromised, where adhesive bonding is permissible.
  5. Nameplate engravings shall include the instrument or equipment tag number and descriptive title as shown and specified.
- B. Tag all internally mounted instruments in accordance with the following requirements:
1. Tag numbers shall be as specified.
  2. The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.

3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.
  4. Identification tag shall be installed so that the numbers are easily visible to service personnel.
  5. Front of panel mounted instruments shall have the tag attached to rear of device.
- C. Tagging of the following items shall be accomplished with the use of adhesive plastic Brady USA, Inc. labels, or equal.
1. Tag all electrical devices (i.e., relays, timers, power supplies) mounted within control panels and enclosures.
  2. Tag all pneumatic lines.
  3. Numerically tag all terminal blocks.
  4. Color code and numerically tag wiring at each end.

## 2.03 PANELS AND ENCLOSURES

### A. General

1. Panels and enclosures shall meet the NEMA requirements for the type specified.
2. Sizes shown are estimates. Contractor shall furnish panels and enclosures amply sized to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, tubing and other components installed within.
3. I/O cabinets are to match in height and depth the adjacent enclosures.

### B. Construction Features

1. Control panels located inside control or electrical room areas shall be NEMA 12 rated.
  - a. Fabricate enclosures using minimum 14 gage steel for wall or frame mounted enclosures and minimum 12 gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.

- b. The Contractor shall continuously weld all exterior seams and grind smooth. Also, surface grind complete removal of corrosion, burrs, sharp edges and mill scale.
- c. Reinforce sheet steel with steel angles where necessary to adequately support equipment and ensure rigidity and to preclude resonant vibrations.
- d. Panel shall be flat within 1/16-inch over a 24-inch by 24-inch area, or flat within 1/8-inch for a larger surface. Flatness shall be checked by using a 72-inch long straight edge. Out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.
- e. Panel shall use pan type construction for doors. Door widths shall not exceed 36 inches.
- f. Doors shall be mounted with full-length heavy-duty piano hinge with stainless steel hinge pins.
- g. The Contractor shall provide oil resistant gasket completely around each door or opening.
- h. The Contractor shall provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.
- i. The Contractor shall use stainless steel fasteners throughout.
- j. The Contractor shall provide interior mounting panels and shelves constructed of minimum 12 gage steel with a white enamel finish.
- k. The Contractor shall provide steel print pocket with white enamel finish.
- l. The Contractor shall provide enclosure mounting supports as required for floor, frame, or wall mounting.
- m. The Contractor shall provide all holes and cutouts for installation of conduit and equipment. Cable and piping to enter the enclosure through the bottom unless otherwise noted. All conduit and piping openings and all conduits shall be sealed watertight.
- n. The Contractor shall completely clean all interior and exterior surfaces so they are free of corrosive residue, oil, grease and dirt. Zinc phosphatize for corrosion protection.

- o. One coat of primer shall be applied to all interior and exterior surfaces immediately after corrosion protection has been applied. Exterior surfaces shall then be given sufficient coats of primer surfacer, applied with sanding and cleaning between coats, until a Grade 1 finish can be produced on the finish coat.
  - p. All interior surfaces shall be painted with 2 coats of semi-gloss white polyurethane enamel.
  - q. All exterior surfaces shall be painted with a minimum of 3 finish coats of polyurethane enamel to ultimately produce a Grade 1 finish (super smooth; completely free of imperfections). Color to be selected by Commissioner from complete selection of standard and custom color charts furnished by the manufacturer. Provide one extra quart of touch-up paint for each exterior finish color.
  - r. Primer and finish paint shall be compatible and shall be a low VOC, high solids polyurethane enamel, Hi-Solids Polyurethane B65 W300 Series as manufactured by Sherwin-Williams, Inc. or equal.
  - s. Provide one extra quart of touch-up paint for each exterior finish color.
2. Control panels located in field (non-control room environment) shall be NEMA 4X rated.
- a. Panels shall be Type 316L stainless steel construction with a minimum thickness of 12 gage for all surfaces (except those areas requiring reinforcement) having a smooth brushed finish.
  - b. Panel shall be furnished with stainless steel screw clamp assemblies on three sides of each door.
  - c. Panels shall be furnished with rolled lip around three sides of door and along top of enclosure opening.
  - d. Panels shall be furnished with hasp and staple for padlocking.
  - e. Panels shall be provided with a clear plastic, gasketed lockable hinged door to encompass all non-NEMA 4 front of panel instruments.
  - f. Provide 3-inch high channel base assembly, with solid bottom, drilled to mate the panel to its floor pad.
  - g. Floor Pad: Refer to Part 3 of this Specification Section.

3. Where the application applies and with the approval of Commissioner, wall mounted enclosures may be provided. The enclosure shall comply with Paragraph B.1. or B.2., except for the following:
  - a. Locations shall be as shown on the Contract Drawings or as specified under other Sections.
  - b. Doors shall be full height.
  - c. Corrosion-resistant polyester quick release latches shall be provided.
  - d. No extra holes or knockouts shall be provided. No light or convenience outlet need be provided.

### C. Electrical Systems

#### 1. Control of Environment

##### a. Outdoor Panels and Indoor Panels in Unheated Areas

- (1) Shall be furnished with adequately sized automatically controlled 120 V AC strip heaters to automatically maintain temperature inside each enclosure above 40°F to maximum of 80°F when the outside temperature is -20°F through 40°F.
- (2) Shall be provide with automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure. Air conditioner shall have a minimum capacity of 4000 BTU. Housing shall be constructed of corrosion resistant materials.
- (3) The Contractor shall provide calculations to prove that cooling is not required.
- (4) Shall be provided with thermostats to automatically control heating and cooling requirements without need of manual operation of a heating/cooling transfer switch.

##### b. Panels in Heated Areas

- (1) Shall be furnished with adequately sized, automatically controlled 120 V AC strip heaters to maintain temperature 10°F above ambient for condensation prevention inside panels.



(2) Shall be provided with automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure.

(3) Air conditioner shall have a minimum capacity of 4,000 BTU.

## 2. Power Source and Internal Power Distribution

- a. General: Control panel power supply source, type, voltage, number of circuits and circuit ratings shall be as shown on the Electrical Drawings.
- b. Panels shall be provided with an internal 120 V AC power distribution panel with number of circuits and separate circuit breakers sized as required to distribute power to the panel components. Distribution panel shall contain two spare breakers minimum.

## 3. Wiring

- a. Internal wiring shall be Type MTW stranded copper wire with thermo-plastic insulation rated for 600 V at 85 C for single conductors, color coded and labeled with wire identification.
- b. For DC panel signal wiring, use No. 18 minimum AWG shielded.
- c. For AC power wiring, use No. 12 minimum AWG. For a-c signal and control wiring, use No. 16 minimum AWG. For wiring carrying more than 15 Amps, use sizes required by NEC and JIC standards.
- d. Low voltage signal wiring and shielded wiring shall be separated from power and control wiring by a minimum of 6 inches.
- e. Parallel runs of wire shall be grouped or bundled using covered troughs. Maximum bundle size to be 1 inch. Troughs shall have 40 percent spare capacity.
- f. Wire troughs along horizontal or vertical routes shall be installed to present a neat appearance. Angled runs are not acceptable.
- g. The Contractor shall adequately support and restrain all wiring runs to prevent sagging or other movement.
- h. The Contractor shall terminate all field wiring at 600 V rated compression-type barrier terminal strips with screwed connections and permanently affixed numeric identifiers beside each connection. Identifiers to be self-stick plastic tape strips with permanent type,

machine printed numbers. All terminal strips shall be capable of handling No. 12 wiring (minimum). Provide Phoenix Contact, Entelec or Allen Bradley.

- i. All wiring shall be installed such that if wires are removed from any one device, power will not be disrupted to any other device.
- j. All alarms generated external to the panel, spare alarm, and repeat contacts shall be wired out to terminal blocks.
- k. The Contractor shall provide spare terminals equal in number to 20 percent of the terminals used for each type of wiring (i.e., DC signal and AC power).
- l. The Contractor shall provide a separate terminal for grounding each shielded cable.
- m. The Contractor shall use separate 5/16-inch diameter copper grounding studs for instrument signal cable shields and AC power.
- n. Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.
- o. When DC power and/or low voltage AC power is required, provide and install the necessary power supplies and transformers in the panel.
- p. The Contractor shall provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.
- q. The Contractor shall provide complete wiring diagram showing "as built" circuitry. Diagram shall be enclosed in transparent plastic and placed in easily accessible pocket built into panel door.

#### 4. Surge Protection

- a. General: Surge protection shall be provided to protect the electronic instrumentation system from surges propagating along the signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Instruments shall be housed in suitable metallic cases, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate junction box (compatible with the area designation) coupled to the enclosure.

- b. The units shall be as manufactured by Phoenix Contact, Innovative Technology, or equal.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. The Contractor shall install equipment in conformance with NEC.
- B. Unless otherwise noted, the Contractor will install indoor freestanding NEMA 4X panels on 4-inch concrete pad. Extend pad 4 inches beyond outside dimensions of base, all sides. Lay grout after panel sills have been securely fastened down.
- C. Unless otherwise noted, install outdoor free-standing NEMA 4X panels on a reinforced concrete pedestal:
  - 1. Minimum Thickness: 8 inches with No. 4 steel reinforcing bars at 12 inches on centers, each way.
  - 2. Minimum Size: 12 inches larger than outer dimensions of base, all sides.
  - 3. The Contractor shall provide excavation and backfill work in conformance with Section 02316 - Excavation and Section 02317 - Backfilling.
  - 4. The Contractor shall provide concrete work in conformance with Section 03300 - Cast-in-Place Concrete.
- D. The Contractor shall install anchor bolts and anchor in accordance with Section 05120 - Structural Steel.
- E. The Contractor shall install and interconnect all equipment, devices, electrical hardware, instrumentation and controls and process controller components into and out of and among the enclosures as indicated on the Drawings.

#### 3.02 TESTING AND ADJUSTMENTS

- A. The Contractor shall perform system testing and make any adjustments necessary in accordance with this Section and Sections 17101 - SCADA System - General Requirements.
- B. The Contractor shall perform power supply, voltage adjustments to tolerances required by the appurtenant equipment.

### 3.03 SPARE PARTS AND TEST EQUIPMENT

- A. The Contractor shall furnish and deliver the spare parts and test equipment as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification Section.
- B. Spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
- C. The following shall constitute the minimum spare parts:
  - 1. Five of each type input-output relay for each 40 or less furnished for this Contract.
  - 2. One replacement power supply for each type and size furnished for this Contract.
  - 3. One dozen of each type and size of fuse used in control panels and enclosures.
- D. The following shall constitute the minimum test and calibration equipment.
  - 1. Two Fluke, Hewlett-Packard, or equal (latest in series) digital multimeter plus amprobe, high voltage probe, test leads, case and all other recommended spares and accessories.
  - 2. All tooling required to insert, extract and connect any internal or external connector, including edge connectors.
  - 3. All special calibration equipment required for system calibration.
  - 4. A thermocouple calibrator including case.
  - 5. One signal simulator (4-20 mA; 1-5 Vdc) including cases. One simulator shall be battery powered and shall include charger.
- E. All spare parts shall have been operated and tested in the factory as part of factory testing prior to shipment of the control system.

- F. For process sensors and all other analog instruments, the supplier shall submit a separate quotation for a recommended list of spare parts and test equipment. Each item recommended shall be listed and priced separately. The spare parts quotation shall contain a statement that the prices quoted are firm for a period of one year from the installation date of the equipment, and that the supplier understand that the City of New York reserves the right to purchase none, any, or all of the parts quoted. The supplier is required to show that a stock of spare-parts and test-equipment is obtainable within a 48-hour period.

-END OF SECTION-

**Section 17330****SCADA SYSTEM - PANEL-MOUNTED INSTRUMENTS AND DEVICES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation panel instruments and devices.
- B. Drawings and Specifications illustrate and specify functional and general construction requirements of the panel components and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. The Contractor shall provide all piping, wiring, accessories and labor required for a complete, workable and integrated system.
- C. Coordination: Contractor shall coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.

**1.02 RELATED SPECIFICATIONS**

- A. Section 17101 - SCADA System - General Requirements
- B. Section 17320 - SCADA System - Control Panels and Enclosures

**1.03 QUALITY ASSURANCE**

- A. Comply with the requirements of Section 17101 - SCADA System - General Requirements.
- B. Acceptable Manufacturers
  - 1. Contractor shall furnish instruments and devices by the named manufacturers or equal equipment by other manufacturers.
  - 2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.
  - 3. Contractor shall obtain all instruments or devices of a given type from the same manufacturer.
- C. Manufacturers' Responsibilities and Services shall include:
  - 1. Design and manufacture the instruments and devices in accordance with the applicable general design requirements specified in Section 17101 - SCADA System - General Requirements and the specifications herein.

2. Field supervision, inspection, start-up and training in accordance with the requirements of Section 17101 - SCADA System - General Requirements.

- D. Instruments and devices shall not be assembled in the panels until all product information and system shop drawings for respective components have been approved.

#### 1.04 SUBMITTALS

- A. Comply with the requirements of Section 17101 - SCADA System - General Requirements.

#### 1.05 IDENTIFICATION TAGS

- A. All panel instruments and devices shall have an identification tag meeting the following requirements:
  1. Tag numbers shall be as listed in the Instrument Index.
  2. Identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.
  3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.
  4. All instruments and devices mounted within panels shall have the stainless steel identification tag installed so that the numbers are easily visible to service personnel. Front of panel-mounted components shall have the tag attached to the rear of the device.
  5. Front of panel-mounted components shall have nameplates which comply with the requirements specified in Section 17320.

### PART 2 PRODUCTS

#### 2.01 CURRENT ISOLATOR

- A. General: The isolating unit shall be a two wire, loop powered device. It shall accept a 4-20 mA input signal and deliver a 4-20 mA output.
- B. Required Features
  1. Repeatability:  $\pm 1$  percent of span
  2. Ambient Temperature Range: -15°F to +185°F

3. Linearity:  $\pm 0.1$  percent of full scale
4. Provide one spare isolator.

C. Product Manufacturer: Provide current isolator of one of the following:

1. Rochester Instrument System
2. Acromag
3. Moore Industries
4. Or equal

## 2.02 CONTROL RELAY

A. Type: General purpose, plug-in type rated for continuous duty

B. Coil Voltages: 24 Vdc and 120 Vac as required

C. Contacts

1. Silver cadmium oxide rated not less than 5 Amperes resistive at 120 Vac or 28 V DC continuous
2. For switching low energy circuits (less than 200 mA) fine silver, gold flashed contacts rated not less than 3 Amperes resistive at 120 Vac or 28 Vdc continuous shall be provided.

D. Relays to have clear plastic dust cover.

E. Relays to be UL recognized.

F. Product and Manufacturer: Provide one of the following:

1. IDEC
2. Potter & Brumfield
3. Allen-Bradley
4. Or approved equal

## 2.03 SELECTOR SWITCHES, PUSH BUTTONS AND INDICATING LIGHTS

A. General

1. Selector switches, push buttons and indicating lights shall be supplied by one manufacturer and be of the same series or model type.
2. Type: Heavy duty, oil tight.
3. Provide legend plate for indication of switch, push button or light function (i.e. Open-Closed, Hand-Off-Auto).



4. Mounting: Flush mounted on control panel front, unless otherwise noted.
5. NEMA rated to match panel in which mounted.
6. Size: 30 mm nominal

**B. Selector Switches**

1. Type: Provide selector switches with number of positions as required to perform intended functions as shown and specified.
2. Contacts:
  - a. Provide number and arrangement of contacts as required to perform intended functions specified but not less than one single pole, double throw contact.
  - b. Type: Double break, silver contacts with movable contact blade providing scrubbing action.
  - c. Rating: Compatible with AC or DC current with devices simultaneously operated by the switch contacts but not less than 10 Amperes resistive at 120 Volts AC or DC continuous.
3. Switch Operator: Standard black knob.

**C. Push Buttons (Standard or Illuminated)**

1. Type: Provide momentary lighted and/or unlighted, single and/or dual type push buttons as required to perform intended functions specified and shown.
2. Contacts: Comply with the requirements specified for selector switches.

**D. Indicating Lights**

1. Type: LED
2. Lamps: 120 Volts
3. Common, push to test circuitry shall be provided for each panel to simultaneously test all indicating lights on the panel using a single push button.

**E. Button and Lens Colors**

1. Red for indication of open, on, running.
2. Green for indication of closed, off (ready), stopped.

3. Amber for indication of equipment malfunction, process trouble and alarms (i.e. high level, low level, etc.).
4. White for indication of electrical control power on.

F. Rotary Cam Switches

1. Provide rotary cam switches with number of positions and poles as required to perform the required signal switching function specified and shown.
2. Contacts:
  - a. Gold-flashed contacts housed in mechanical contact blocks with number and arrangement of contacts as required to perform intended functions.
  - b. Contact Rating: Compatible with AC or DC through-put current of signals and devices simultaneously operated by the switch contacts but not less than 20 Amperes at 600 VAC or 250 V DC continuous.
3. Switch Operator: Standard black knob

G. Product and Manufacturer: Provide one of the following:

1. Type E30, as manufactured by Cutler-Hammer
2. Series 800, as manufactured by Allen Bradley
3. Or approved equal

2.04 CURRENT ALARM RELAY

- A. Type: Programmable direct current alarm
- B. Input: 4-20 mA DC; 1-5 V DC
- C. Output: Dual alarms SPDT relays rated @ 5A, 117 V AC non-inductive.
- D. Indicator: 3 1/2 digit LCD Digital indication of trip points in engineering unit with LEDs on front panel indicating alarm status.
- E. Diagnostics: Error message display for sensor break, lost of communication; output shall default to programmable state.
- F. Signal retransmission: Isolated 4-20 mA DC retransmission of input signal.
- G. Transmitter excitation: 2-wire transmitter power supply.
- H. Display accuracy: +/- 0.05% of span includes repeatability, hysteresis, and adjustment resolution.

- I. Trip point repeatability:  $\pm 0.05\%$  of input span
- J. Dead Band: 1% of span.
- K. Signal response: -3dB @ 5 Hz.
- L. Isolation: 500 V AC, input to output to power.
- M. Alarm response: 150 msec. Max.
- N. RFI/EMI Effect: Unit shall not go into alarm with field strengths 10 V/m present at 20-500 MHz unless process variable is within  $\pm 1\%$  of trip point.
- O. Ambient temperature: 0 to 150 Deg. F.
- P. Housing: DIN style rail mounting with removable terminal blocks.
- Q. Adjustments: Front panel push-button control settings for zero, span, alarm trip points.
- R. Power: 24V DC  $\pm 10\%$ .
- S. Product and Manufacturer: Provide one of the following:
  - 1. SPA series as manufactured by Moore Industries.
  - 2. Or approved equal

## 2.05 POWER SUPPLIES

- A. General: Single unit and multiple unit power supplies, located in control room panels, remote terminal units and field panels as required.
- B. Single Unit Required Features
  - 1. Solid state circuitry
  - 2. Surface mounting
  - 3. Input Voltage: 117 V AC  $\pm 10$  percent, 60 Hz
  - 4. Output Voltage: 24 V DC or as required
  - 5. Line/Load Regulation:  $\pm 0.005$  percent
  - 6. Ripple: 0.25 mV RMS
  - 7. Overload Protection: Internal preset
  - 8. Include mounting brackets, fuse, and mating connector for AC power plug

## C. Multiple Unit Required Features

1. Solid state circuitry
2. Standard 19-inch RETMA (EIA) rail mounting
3. Input Voltage: 120 V AC  $\pm$  10 percent, 60 Hz
4. Output Voltage: 24 V DC or as required.
5. Include over-voltage protection, output current limiting protection, power supply failure alarm contacts, provisions for paralleling power supplies and front panel-mounted indicating fuses, test jacks and adjustments.
6. If the power supplies are connected in parallel, provide isolation diodes in series with the positive lead of each of the parallel connected power supplies.
7. Connections: Twist-lock AC power connector, or DC power terminal strip.

## D. Product Manufacturer: Provide power supply units of one of the following:

1. Acopian
2. Or approved equal

## 2.06 LOOP-POWERED METER

- A. Type: 3.5 digit, loop-powered, backlit digital meter
- B. Input: 4-20 mA
- C. Display: 0.5 inch high LCD, 3.5 digits with backlighting; user selectable decimal point
- D. Calibration: 2 Step; non-interacting zero and span
- E. Maximum Input Current: 30 mA
- F. Maximum Voltage Drop: 1.5 VDC @ 20 mA; 3.5 VDC @ 20 mA
- G. Accuracy:  $\pm$  0.1% of span
- H. Connections: Removable screw terminal block
- I. Operating Temperature: -40 to 85°C
- J. Enclosure: NEMA 4X, Explosion Proof as specified.

K. Product Manufacturer: Provide one of the following:

1. PD 660-B as manufactured by Precision Digital.
2. Or approved equal

## 2.07 STROBE WARNING LIGHT

A. General: The light shall provide a visual warning where a potential hazard may occur.

B. Required Features

1. Strobe Light: 1,000 effective candle power
2. Lens Color: Amber
3. Enclosure: Cast aluminum housing, corrosion resistant
4. Power: 120 Vac
5. Surface mountable (mount kit, LWMB2)
6. UL Listed

C. Product and Manufacturer: Provide one of the following:

1. Model 371 DST, as manufactured by Federal Signal
2. Or equal

## 2.08 SPARE PARTS AND TEST EQUIPMENT

A. The Contractor shall furnish and deliver the spare parts and test equipment as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this Specification.

B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. The following shall constitute the minimum spare parts:

1. Five of each type of input-output relay for each 40 or less furnished for this Contract.
2. One replacement power supply for each type and size furnished for this Contract.
3. One per ten (two, if fewer than twenty) of each type of panel-mounted instrument including lights, push buttons

4. Lamps for Indicating Lights
    - a. 50 percent spare lamps of each color of incandescent lamp provided
    - b. Two of each color of LED-type lamp provided
  5. One dozen of each type and size of fuse used in panels and instruments.
- D. The following shall constitute the minimum test and calibration equipment:
1. All tooling required to insert, extract and connect any internal or external connector, including edge connectors.
  2. All tooling required to insert, extract and connect any internal or external connector, including edge connectors.
- E. All spare parts shall have been operated and tested in the factory as part of factory testing prior to shipment of the control system.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install each item in accordance with manufacturer's recommendations and in accordance with the Contract Documents.
- B. All items shall be mounted and anchored in compliance with Section 17320 - SCADA System - Control Panels and Enclosures.

#### 3.02 START-UP, CALIBRATION, AND TESTING AND TRAINING

- A. Comply with the requirements of Section 17101 - SCADA System - General Requirements.

-END OF SECTION-

**NO TEXT ON THIS PAGE**

**Section 17600**  
**SCADA SYSTEM - CONTROL STRATEGIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contractor shall furnish control strategy diagrams, configuration sheets and control strategy descriptions as shop drawings for approval.
- B. Contractor shall perform all programming, configuration and tuning.

**1.02 RELATED SPECIFICATIONS**

- A. Section 17101 - SCADA System - General Requirements
- B. Section 17270 - SCADA System - Monitoring and Control Criteria

**1.03 SUBMITTALS**

- A. The control strategies are written descriptions of the basic configuration and/or programming required to implement monitoring and control of the unit processes as shown on the Contract Drawings. They do not in all cases describe the process characteristics fully, many of which may become apparent only during start-up. Control strategies shall fully reside in the memory of the designated PLC. The process inputs/outputs referred to in the Control Strategies are shown or specified. Any additional I/O (Maximum 20%) required shall be added during Shop Drawing Review. It shall be provided at no additional cost to the City of New York.
- B. Process Control Functions: Process control function shall be structured to permit the realization of all control strategy requirements. In addition, each control function shall be designed so that bumpless, balance free transfers are obtained during operating mode changeover and initialization. Where applicable, user-changeable parameters shall be automatically defaulted to a preset value if a specific value is not given during system generation.
  - 1. Provision shall be made to include certain control functions that apply to all analog inputs, virtual variables, analog controllers and discrete control whether or not shown on the P&IDs, even though one or more of the functions may be disabled by the user for a given data base point:
    - a. Analog Data Scaling: Scale all analog inputs to a common span and shall normalize the digital representation of each analog input to a percent of the operating span. The processed value shall be expressed as a binary number that specifies the analog input's position on a straight line lying between zero and full scale as defined for a given input by the zero span values in the data base.



- b. Amplitude Limit Check: Perform dual level, high/low amplitude limit checking and shall identify a limit violation every time a measured or virtual variable goes out-of-limits and returns back into limits. The control function shall determine the time at which each limit excursion occurred. A deadband shall be provided on each limit and shall be expressed as a percentage of span or in engineering units. Low and high limiting default values will be set-up for each measured or calculated variables used in the process control loops.
- c. Engineering Unit Conversion: This control function shall convert scaled analog data to engineering units by means of the following equation:

$$Y = (H - L) (D/DH) + L$$

where:

Y = value in engineering units.

H = high value of span, expressed in engineering units.

L = low value of span, expressed in engineering units.

D = digitized scaled input value in counts.

DH = full scale digitized value in counts

- d. Manual Control: It shall be possible for operator or plant engineer to interrupt any sequence, loop or automatic operation and operate the same manually through operator workstation.
  - e. Verification Of Digital Outputs: Verify that the equipment has responded to the digital commands before proceeding to next step during automatic operation. If any discrepancy is detected, an alarm will be annunciated.
- C. Hardware: The Contractor shall provide all the hardware, whether or not shown or specified that maybe necessary to implement the control strategies as described.
  - D. Configuration: All set points, tuning parameters and engineering scales etc. shall be documented for each control point and each control strategy on configuration sheets or similar documents. These documents shall be updated during factory testing and finally during start-up.
  - E. Control Strategy Displays shall be submitted for review. Displays shall clearly show initial conditions, start, and progression of the control strategies. Each control strategy shall be displayed in a minimum number of displays for ease of monitoring by the operator.

- F. Plant Power Failure: Plant equipment controlled by the PLC shall be programmed to automatically reset upon failure.
- G. Restart: All equipment and motors shall be automatically restarted after power failure by the control system in an orderly fashion approved by the Commissioner.
- H. All relays, training parameters, scales, configuration values, mathematical constants, equations and set points given in the control strategies are adjustable over a wide range. Initial values are given and may change during shop drawing review and may have to be readjusted during start-up.

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 CONTROL STRATEGIES

#### A. General Requirements

1. The following pages describe the control strategies to be implemented by the Contractor under this Specification Section. The following requirements are general in nature, and are to be used throughout the programming for the system. Time delays, set points, and other variables used in programming shall be adjustable by the user.
2. Control strategies shall be implemented in accordance with Section 17270 – SCADA System – Monitoring and Control Criteria.
3. General Motor Control
  - a. When a motor is to be started by the SCADA system
    - (1) Verify SCADA mode signal is true
    - (2) Verify failure or trouble signal is not true
    - (3) Activate run command signal
    - (4) After a preset adjustable time period, verify running feedback signal is true
    - (5) After a preset adjustable time period, verify positive feedback signal is true, if available
    - (6) Disable and alarm if any step fails.

- b. When a motor is to be stopped by the SCADA system
  - (1) De-activate run command signal
  - (2) After a preset adjustable time period, verify running feedback signal is false
  - (3) Disable and alarm if any step fails.
- 4. Running Feedback Signals: Calculate cumulative running hours based on the status of each running feedback signal.
- 5. Output Signals
  - a. Each output signal shall be capable of being controlled by the operator directly. Provide a control point, accessible from a display, for each output signal.
  - b. Some outputs shall also be capable of being controlled automatically by the results of software strategies specified herein. Provide these output signals with a software selector switch, accessible from a display, allowing the operator to select between control by the operator, or by the software strategy.
- 6. General Lead-Lag Routine
  - a. Where a set of controlled equipment is specified as lead-lag service, provide a software selector switch to allow the operator to designate the lead and lag equipment.
  - b. When the strategy calls for an additional piece of equipment, the next available device, based on the lead-lag sequence selected, shall be put in service.
  - c. When the strategy calls for a piece of equipment to be removed from service, the next available device, based on the lead-lag sequence selected, shall be taken out of service.
  - d. A failed device, or one that is not in SCADA mode, will be bypassed when starting or stopping device based on lead-lag sequencing.
- 7. General Automatic Failover Routine
  - a. Where a set of controlled equipment has multiple devices capable of providing a common service, provide an automatic failover routine for each device, including the following steps:

- (1) Check that the standby device is not running
    - (2) Check that the standby device is not failed
    - (3) Check that the standby device is in SCADA mode
    - (4) Remove the failed device from service
    - (5) Start the standby device
  - b. Disable and alarm if the routine fails on a failure of any step above within a given time delay.
  - c. Where multiple standby devices are available, use the lead-lag settings to determine the order of standby devices.
- B. M01: Dust Suppression System (F-DSS-01) Pumping
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: none
  3. Display: Provide a screen display showing all major equipment comprising the dust suppression system, including the pumping station and the distribution piping and zone valves. The display shall be a flow schematic diagram, and shall indicate signal values graphically on the display.
- C. M02: Dust Suppression Zone Valves (F-DSV-01 to F-DSV-09)
1. Monitoring: Monitor signals scheduled and shown. Signals shall be received from the dust suppression system control panel as shown and specified in Section 11570.
  2. Control: Control signals scheduled and as shown. . Signals shall be sent to the dust suppression system control panel as shown and specified in Section 11570. Set outputs based on operator input via screen display.
  3. Display: Provide a screen display showing all dust suppression zones. The display background shall be a plan view of the tipping and loading levels. Provide mode and status of each zone on display. Provide software switch to control each zone valve.
- D. M03: Odor Control System (F-OCS-01) Pumping
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: none
  3. Display: Provide a screen display showing all major equipment comprising the odor control system, including the pumping station and the distribution

pipng and solenoid valves. The display shall be a flow schematic diagram, and shall indicate signal values graphically on the display.

E. M07: Constant Tension Winches (F-CTW-01, -02)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

F. M12: Heat Tracing System (F-HTS-01)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

G. M17: Tipping Bay Traffic Signaling System (F-TSS-09 to -14)

1. Monitoring: none
2. Control: Control signals scheduled and as shown. Set outputs based on operator input via screen display.
3. Display: Provide a screen display showing all major equipment comprising the tipping bay traffic signaling system. The display shall be a plan view of the tipping floor, indicating signal locations. Indicate signal output values graphically on the display. Provide software toggle switch to set red, green, or neither output on.

H. M18: Container Transport System (F-CTS-01 to -04)

1. Monitoring: Monitor signals scheduled and shown. Signals shall be received from the shuttle car network as shown. Information transferred shall include the following for each shuttle car:
  - a. Shuttle car failure
  - b. Shuttle car safety stop
  - c. Shuttle bay door open
  - d. Shuttle bay door closed
  - e. Shuttle bay door failure
2. Control: None
3. Display:
  - a. Indicate shuttle car alarms on alarm display package.

- b. Indicate position of shuttle bay doors on the graphic for Architectural system A2 below.
- I. M19: Fluids Monitoring (F-FMS-01))
  - 1. Monitoring: Monitor signals scheduled and shown.
  - 2. Controls: none
  - 3. Display: Indicate alarms on alarm display package.
- J. M20: Service Water System (F-SWS-01)
  - 1. Monitoring: Monitor signals scheduled and shown.
  - 2. Control: none
  - 3. Display: Provide a screen display showing all major equipment comprising the service water system, including the pumping station and the distribution piping and hose reels. The display shall be a flow schematic diagram, and shall indicate signal values graphically on the display.
- K. M21: Fuel Management System
  - 1. Monitoring: Monitor signals scheduled and shown.
  - 2. Controls: none
  - 3. Display: Indicate alarms on alarm display package.
- L. A02: Loading Level Truck Door (F-OHD-03)
  - 1. Monitoring: Monitor signals scheduled and shown.
  - 2. Control: none
  - 3. Display: Provide screen display showing all major equipment comprising architectural systems A02, A05, and A06. Display shall be a plan view of the station, indicating equipment locations. Indicate signal values graphically on the display.
- M. A05: Inbound Sanitation Truck Door (F-OHD-01)
  - 1. Monitoring: Monitor signals scheduled and shown.
  - 2. Control: none
  - 3. Display: See A02 display above.

## N. A06: Outbound Sanitation Truck Door (F-OHD-02)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See A02 display above.

## O. A08: Main Entrance Gate (F-HSG-01)

1. Monitoring: none
2. Control: Control signals scheduled and as shown. Set output based on operator input via screen display.
3. Display: Provide a screen display indicating equipment location within the facility. Indicate signal output values graphically on the display. Provide software toggle switch to set open output on.

## P. H01: Supply Fans (F-SAF-01 to -06)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: Supply fans SAF-01, -03, and -05 serve the loading area. Supply fans SAF-02, -04, and -06 serve the tipping area. Exhaust fans EAF-01 to EAF-06 serve the tipping and loading levels of the station.
  - a. Each fan is controlled by an On-Off-Auto selector switch located adjacent to the fan. Supply a software control strategy for automatic control of the fans when the fan is in the Auto mode. The strategy shall consist of automatic control based on air changes. The operator shall select the number of air changes per hour, from a selection of 4, 8, or 12 air changes per hour. Using the fan capacity table and the position of the lead-lag selector switches, the SCADA system shall operate the proper fans. Lead-lag operation shall be in accordance with the general lead-lag routine specified in this Section.
  - b. Lead-Lag Selection

Loading area supply fans: Provide a three-position software selector switch for selection of lead and lag fans. Provide selector with the following position selections: SAF-03, SAF-05 and SAF-01.

- (a) Fan lead-lag sequence SAF-03, -05, -01, -03, -05, etc.
- (b) SAF-03 Lead: operates (in order) SAF-03, -05, -01
- (c) SAF-05 Lead: operates (in order) SAF-05, -01, -03

- (d) SAF-01 Lead: operates (in order) SAF-01, -03, -05
- (2) Tipping area supply fans: Provide a three-position software selector switch for selection of lead and lag fans. Provide selector with the following position selections: SAF-04, SAF-06 and SAF-02.
- (a) Fan lead-lag sequence: SAF-04, -06, -02, -04, -06, etc.
- (b) SAF-04 Lead: operates (in order) SAF-04, -06, -02
- (c) SAF-06 Lead: operates (in order) SAF-06, -02, -04
- (d) SAF-02 Lead: operates (in order) SAF-02, -04, -06
- (3) Tipping and loading area exhaust fans: Provide a four-position software selector switch for selection of lead and lag fans.
- (a) Exhaust fans EAF-03 and -05 run continuously.
- (b) EAF-01 Lead: operates (in order) EAF-03, -05, -01, -06, -02, -04
- (c) EAF-06 Lead: operates (in order) EAF-03, -05, -06, -02, -04, -01
- (d) EAF-02 Lead: operates (in order) EAF-03, -05, -02, -04, -01, -06
- (e) EAF-04 Lead: operates (in order) EAF-03, -05, -04, -01, -06, -02

- c. Fan Operation Table: The following table indicates the correlation between air changes desired and fan operation.

Air Changes per Hr.	# of Supply Air Fans						# of Exhaust Air Fans		
	Loading			Tipping					
	1	2	3	1	2	3	2	4	6
4	✓			✓			✓		
8		✓			✓			✓	
12			✓			✓			✓

- d. Pressurization Control: An additional strategy shall be provided which allows adjustment of the number of operating fans in the Fan Operation Table specified above. The operator shall have the ability to enable this strategy via a software switch.



- (1) The SCADA system shall monitor the position of the inbound and outbound truck doors in the tipping area, and the position of the loading level truck door in the loading area of the station. In order to maintain a negative pressure within the station, the number of process fans operating shall be modified if any of these high-speed doors is open.
- (2) When the high-speed doors serving the tipping and loading areas of the station are closed, the supply and exhaust fans serving the tipping and loading areas shall be operated by the SCADA system in equal numbers, as indicated in the fan capacity table. There is no offset required.
- (3) Upon receiving a door open signal from any high-speed door serving the tipping and loading areas of the station, the SCADA system shall perform a two-fan offset.
- (4) Pressurization Offset: The SCADA system shall stop one of the operating Tipping Area supply fans. Stop the first fan in the Lead-Lag sequence. The stopped supply fan shall remain stopped until all of the high-speed doors are closed for an adjustable preset (15 minutes) time period. See the following Fan Operation Table for Pressurization Control.

Fan and Operation Table - Pressurization Control									
Air Changes per Hr.	# of Supply Air Fans						# of Exhaust Air Fans		
	Loading			Tipping					
	1	2	3	1	2	3	2	4	6
4	✓						✓		
8		✓		✓				✓	
12			✓		✓				✓

- e. Temperature Control: An additional strategy shall be provided which allows adjustment of the number of air changes per hour based upon outside air temperature. The operator shall have the ability to enable this strategy via a software switch. When this strategy is selected by the operator, the fans shall be controlled based on the space temperature in the area served.
  - (1) If the space temperature is below 32 degrees F, run fans to maintain 4 air changes per hour.
  - (2) If the space temperature is between 32 and 59 degrees F, run fans to maintain 8 air changes per hour.
  - (3) If the space temperature exceeds 59 degrees F, run fans to maintain 12 air changes per hour.

- (4) Multiple temperature sensors shall be installed at the mezzanine level. The temperature control shall be based on the lowest value of the three temperature readings.

f. Fire Override

- (1) Upon receipt of a fire signal from the Fire Alarm Control Panel, the SCADA system shall remove the run command signal from all fans.
  - (2) The SCADA system shall not resume control of the fans until the fire signal clears, and the operator resets the fans via a software switch on the display.
3. Display: Provide a screen display showing all major equipment comprising HVAC systems H01, H02, H03 and H09, including the fans and major duct runs. Display shall be a plan view of the station, indicating equipment locations. Indicate signal values graphically on the display. Include software switches as specified.

Q. H02: Exhaust Fans (F-EAF-01 to -06)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: See HVAC system H01 control above.
3. Display: See HVAC system H01 display above.

R. H03: Space Temperature Monitoring

1. Monitoring: Monitor signals scheduled and shown.
2. Control: See HVAC system H01 control above.
3. Display: See HVAC system H01 display above.

S. H04: Two Speed Supply Fan (F-SAF-08)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: Supply fan SAF-08 and EAF-08 serve the lidding area of the station.
  - a. Each fan is controlled by an On-Off-Auto selector switch located adjacent to the fan. Supply a software control strategy for automatic control of the fans when the fan is in the Auto mode. The strategy shall consist of automatic control based on air changes. The operator shall select the number of air changes per hour directly, from a selection of 6 or 12 air changes per hour. Using the fan capacity table, the SCADA system shall operate the fans at the proper speed.

- b. Fan Capacity Table: The following table indicates the correlation between air changes desired and fan operation.

Air Changes per Hour	Speed of Supply Fan SAF-08	Speed of Exhaust Fan EAF-08
6	Low	Low
12	High	High

- c. Negative Pressure Maintenance: An additional scheme shall be provided which allows for the adjustment to the operating status of the fans computed in the automatic control strategy specified above. The operator shall have the ability to turn off this additional scheme via a software switch.

- (1) The SCADA system shall monitor the position of the shuttle bay doors in the station. In order to maintain a negative pressure within the station, the speed of the process fans operating shall be modified if any shuttle bay door is open.
- (2) When all shuttle bay doors are closed, the supply and exhaust fans serving the lidding area shall be operated by the SCADA system equally; that is, supply and exhaust fans both run at low or high speed, as indicated in the fan capacity table.
- (3) Upon receiving a door open signal from any of the shuttle bay doors, the SCADA system shall perform an offset and operate the exhaust fan in accordance with the table that follows. The offset shall remain until the shuttle bay doors are closed for an adjustable preset (15 minutes) time period.
- (4) Negative Pressure Maintenance Fan Capacity Table:

Air Changes per Hour	Speed of Supply Fan SAF-08	Speed of Exhaust Fan EAF-08
6	Off	Low
12	Low	High

- d. Fire Override

- (1) Upon receipt of a fire signal from the Fire Alarm Control Panel, the SCADA system shall remove the run command signal from all fans.
- (2) The SCADA system shall not resume control of the fans until the fire signal clears, and the operator resets the fans via a software switch on the display.

3. Display: Provide a screen display showing all major equipment comprising HVAC systems H04, H05 and H11, including the fans and major duct runs. Display shall be a plan view of the station, indicating equipment locations. Indicate signal values graphically on the display. Include software switches as specified.
- T. H05: Two Speed Exhaust Fan (F-EAF-08)
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: See HVAC system H04 control above.
  3. Display: See HVAC system H04 display above.
- U. H06: Personnel Area HVAC Systems (F-ACU-01 to -05; F-RTU-02; F-HVU-01, -02)
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: none
  3. Display: Indicate alarms on alarm display package.
- V. H08: Gas Monitoring (F-GMP-01)
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: none
  3. Display: Indicate alarms on alarm display package.
- W. H09: Exhaust Fan (F-EAF-14)
1. Monitoring: Monitor signals scheduled and shown.
  2. Control: Exhaust fan EAF-14 serves the tipping area of the station.
    - a. Each fan is controlled by an On-Off-Auto selector switch located adjacent to the fan. Supply a software control strategy for automatic control of the fans when the fan is in the Auto mode. The fan shall run continuously when in the Auto mode.
    - b. Fire Override
      - (1) Upon receipt of a fire signal from the Fire Alarm Control Panel, the SCADA system shall remove the run command signal from all fans.
    - c. The SCADA system shall not resume control of the fans until the fire signal clears, and the operator resets the fans via a software switch on the display.
  3. Display: See HVAC system H01 display above.

## X. H10: Heat Tracing System (F-HTS-03)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

## Y. H11: Gallery and Ramp Area Supply and Exhaust Fan (F-SAF-07, F-EAF-07)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: Supply fan SAF-07 and exhaust fan EAF-07 serve the gallery and ramp areas of the station.
  - a. Each fan is controlled by an On-Off-Auto selector switch located adjacent to the fan. Supply a software control strategy for automatic control of the fans when the fan is in the Auto mode. The fans shall run continuously when in the Auto mode.
  - b. Fire Override
    - (1) Upon receipt of a fire signal from the Fire Alarm Control Panel, the SCADA system shall remove the run command signal from all fans.
    - (2) The SCADA system shall not resume control of the fans until the fire signal clears, and the operator resets the fans via a software switch on the display.

3. Display: See HVAC system H04 display above.

## Z. H12: Chimney Automation System (F-DIF-01, F-DIF-02)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

## AA. P02: Oil/Water Separator (F-OWS-01)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Provide screen displays showing all major equipment comprising plumbing systems P02 through P10. Displays shall indicate equipment location within the station. Indicate signal values graphically on the display.

## BB. P04: Booster Pumping (F-DWP-01)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Plumbing system P02 display above.

## CC. P06: Interstitial Space Monitoring (F-WAF-01)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Plumbing system P02 display above.

## DD. P08: Fire Pump Monitoring

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Plumbing system P02 display above.

## EE. P09: Emergency Shower/Eyewash (F-SEW-01, -02, -03, 04)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Plumbing system P02 display above.

## FF. P10: Heat Tracing System (F-HTS-02)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Plumbing system P02 display above.

## GG. E01: Switchgear (F-LSG-01)

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Provide a screen display showing all major equipment comprising Electrical systems E01, E02, and E08. Indicate signal values graphically on the display.

## HH. E02: Emergency Power

1. Monitoring
  - a. Monitor signals scheduled and shown.

- b. Determine electric power source.
  - (1) If generator breaker is closed and the generator is running, the power source is the emergency generator.
  - (2) Otherwise, the power source is the utility.
- 2. Control: The following equipment is controllable from the SCADA system for the purposes of this strategy: Supply fans SAF-03 and -04, Exhaust Fans EAF-01 and -06, and tipping bay lights TSS-09 through -14.
  - a. The control logic for each piece of equipment controllable by the SCADA system under generator power shall include a link to this control strategy. The equipment's control by the SCADA system while powered by the generator shall be via this control strategy. The equipment's normal control strategy shall provide an enable/disable software switch for this feature.
  - b. In the event of a loss of utility power, the SCADA system shall store the operating status (prior to outage) for all equipment controllable by the SCADA system.
  - c. Process Fans
    - (1) On power failure, the fans will stop. Suspend the normal algorithm.
    - (2) On generator power, the following fans will have power available: SAF-03 and -04, and EAF-01 and -06. When generator power is available, wait an adjustable time period, and then start EAF-01, then SAF-03, then EAF-06, then SAF-04, waiting an adjustable time period being each start.
    - (3) On return to utility power, return to the normal algorithm. If additional fans are requested by the normal algorithm, restart one fan at a time, similarly to the procedure for starting fans under generator power.
  - d. Tipping Bay Lights
    - (1) On power failure, the lights will de-energize.
    - (2) On generator power, energize the lights that had been on before the outage. Operator shall be able to turn lights on and off via the SCADA system in the same manner as on utility power.

- (3) On return to utility power, energize the lights that had been on during the outage.

3. Display: See E01 display above. Show electric power source on display. Indicate alarms on alarm display package.

II. E04: Security and Process CCTV

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

JJ. E06: Access Control

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

KK. E06: Fire Alarm Control Panel

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: Indicate alarms on alarm display package.

LL. E08: Network Protectors

1. Monitoring: Monitor signals scheduled and shown.
2. Control: none
3. Display: See Electrical system E01 display above.

-END OF SECTION-



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**THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS**

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**Contract for Furnishing all Labor and Material Necessary and Required for:**

**CONTRACT NO. 1 GENERAL CONSTRUCTION WORK**

**Southwest Brooklyn Marine Transfer  
Station - Building Construction**

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BOROUGH: Brooklyn 11214  
CITY OF NEW YORK**

Contractor

Dated \_\_\_\_\_, 20\_\_\_\_

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Dated \_\_\_\_\_, 20\_\_\_\_

